Additional part of the Main Practice Book

Board Exam Question Papers

10. Dhaka Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The length of a bar is 15 mm measured by a simple scale. The Vernier coincidence has got 8 when the length of the bar measured by a slide calipers of Vernier constant of 0.01 cm.

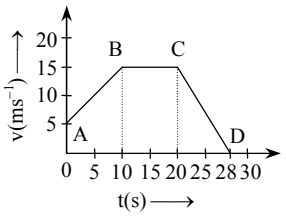
a. What is dimension? 1

b. Why screw gauge is more acute than slide calipers in case of measurement? 2

c. Determine the number of divisions of Vernier scale as the stimulate information. 3

d. What will be the length of the bar by the slide calipers mentioned in the stem? 4

2. ▶ **The graph of the path of motion of a car is given below:**



a. What is rest? 1

b. "The displacement of the object does not depend on the path."– Explain. 2

c. Determine the acceleration of AB part. 3

d. Calculate the total distance covered by the car. 4

3. ▶ A body of mass 10 kg is at rest. A force of 10 N acts on it for 5 sec. Then the body moves with uniform velocity for 5 sec. Again 5 N force acts on it for 10 sec.

a. Define rolling friction. 1

b. Mass quantifies inertia– Explain. 2

c. Calculate the distance covered by the body in first 10 sec. 3

d. Analyze the motion of the object by drawing velocity vs time graph according to the information of the stem. 4

4. ▶ An engine of power 10 kW can lift up 2000 kg water at a height 90 m in 3 minutes.

a. What is geo-thermal energy? 1

b. Explain the effect of hydroelectric plant on environment. 2

c. Calculate the efficiency of the engine. 3

d. How much power should be changed to lift up same amount of water at a height of 120 m in same time by that engine? Give your opinion with mathematical analysis. 4

5. ▶ The area of cross section of an object is 300 cm^2, height 0.1 m and the mass of the object is 5.5 kg.

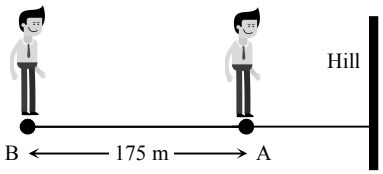
a. What is pressure? 1

b. Why there is no unit of strain? 2

c. Determine the weight of the stimulate object in water. 3

d. For what change of volume of stimulate object, it will float with fully immersed in water? Give mathematical logic. 4

6. ▶



The man standing at point B created a sound After 1.0857 s he heard the echo of that sound.

a. What is amplitude? 1

b. Why the velocity of sound depends on humidity? Explain. 2

c. Determine the distance between the man standing at A and the hill. 3

d. Will the man standing at A hear the echo? Give logic mathematically. 4

7. ▶ In front of a concave mirror an object is placed at a distance 10 cm. For that a virtual image is formed at a distance 20 cm.

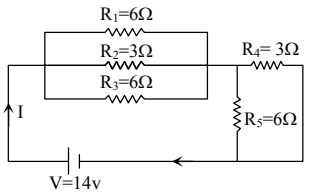
a. What is mirror? 1

b. Why the reflection angle is zero, when a ray is incident perpendicularly on the reflecting surface? Explain. 2

c. Calculate the radius of curvature of the mirror. 3

d. How real and virtual image are formed by the stimulate mirror? Show it with ray diagram and also mention the position, size and nature of the image. 4

8. ▶



a. What is called electromotive force? 1

b. Why specific resistance and conductivity are opposite? 2

c. Find the equivalent resistance of the circuit. 3

d. Will the current flowing through R_2 and R_4 be equal? Analyze mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. What is percentage of visible planets, stars and galaxies of the universe can the physicist explain?
a 4% b 5%
c 6% d 7%

2. Which two of the forces combine electro-weak force?
a Electromagnetic force and gravitational force
b Electromagnetic force and weak nuclear force
c Electromagnetic force and strong nuclear
d Strong nuclear force and weak nuclear force

3. By which equation will the mass of the object be possible to convert into energy?
a $E = \frac{1}{2}mv^2$ b $E = mgh$
c $E = mc^2$ d $F = ma$

4. What is the amount of Uranium in nature?
a 0.9% b 0.7%
c 0.6% d 0.4%

5. Which one of follwowing conditions do the laws of falling bodies of Galileo follow?
i. All bodies fall from rest
ii. All bodies fall from same height
iii. All bodies fall freely
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. How much stronger is electromagnetic force than gravitational force?
a 10^{36} b 10^{39}
c 10^{63} d 10^{93}

Answer the questions no. 7 and 8 according to following graph:

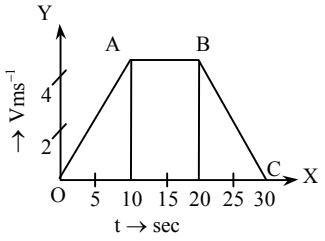


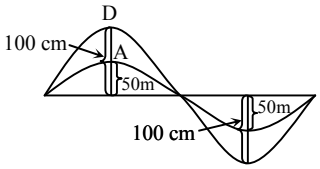
Fig: Velocity-time graph

7. What is the acceleration of the car?
a 0.8 m/s^2 b 0.6 m/s^2
c 0.4 m/s^2 d 0.2 m/s^2

8. What is the distance travelled by the car with uniform velocity?
a 40 m b 60 m
c 80 m d 100 m

9. What is the value of gravitational constant G?
a 6.67×10^{11} Nm^{2}kg^{-2}
b 6.67×10^{-11} Nm^{-2}kg^{-2}
c 6.67×10^{-11} Nm^{2}kg^{-2}
d 6.67×10^{11} Nm^{2}kg^{-1}

10.



If energy at A is 100 J, what is the amount of energy at D?
a 50 J b 200 J
c 300 J d 400 J

11. Density of cork is 0.25 × 10^3 kg/m^3. What percentage of the cork will remain under water if it is released in water to float?
a 25% b 15%
c 10% d 5%

12. Which one is the unit of pressure?
a kgm^{-1}s^{-2} b kgm^{2}s^{-2}
c kgms^{-2} d kgm^{2}s^{-3}

13. A stick of a match box is rubbed with box by a force of 3N. What amount of energy is consumed in rubbing the stick if it is stretched 4 cm?
a 0.12 J b 1.2 J
c 1.176 J d 12 J

14. Whose unit is Nm^{-2}?
i. Pressure ii. Stress
iii. Modulus of elasticity
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

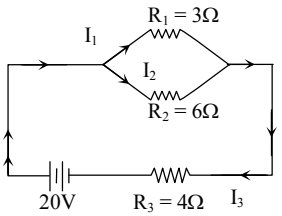
15. The depth of a pond is 3m. What will be the pressure at the bottom of the pond?
a 2.94×10^4 Pa b 2.09×10^4 Pa
c 0.29×10^4 Pa d 2.94×10^{-4} Pa

16. Buoyancy is–
i. the weight of liquid displaced by the object
ii. the resultant upward force
iii. Vρg
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

17. At what position of a concave mirror is the bulb used in torch light kept?
a Between focal point and pole
b Outside the focal point
c At the centre of curvature
d At focal point

18. An object is placed at a distance 30 cm from a concave mirror and image is formed at a distance 30 cm away. What will be the focal lenght of the mirror?
a 0.30 m b 0.15 m
c 1.00 m d 1.5 m

19. If an object is placed at a distance 10 cm in front of a plane mirror, at what distance in cm from the object will the image be formed?
a 0 b 5
c 10 d 20



Answer the question no. 20 and 21 in the light of above stem:

20. What is the equivalent resistance in Ohm?
a 3 b 4
c 5 d 6

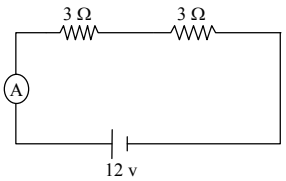
21. Which relation is correct?
a $I_1 = I_2$ b $I_2 > I_3$
c $I_1 + I_2 = I_3$ d $I_1 > I_3$

22. Which one is the unit of conductivity (σ)?
a Ωm^{-1} b Ωm
c $\Omega^{-1}m$ d $\Omega^{-1}m^{-1}$

23. What is rheostat?
a Circuit breaker
b Variable resistance
c Fuse d Capacitor

24. Which one is the unit of intensity of sound?
a Nm^{-2} b Hz
c Wm^{-2} d Nm

25 What is the reading of Ammeter in the circuit?



What is the reading of Ammeter in the circuit?
a 1 Amp b 2 Amp
c 4 Amp d 6 Amp

Ans.																										
	1	a	2	b	3	c	4	b	5	d	6	a	7	c	8	a	9	c	10	d	11	a	12	a	13	a
	14	d	15	a	16	c	17	d	18	b	19	d	20	d	21	c	22	d	23	b	24	c	25	b		

11. Mymensingh Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ Scenario-1: The length of a cubic stone is 8 cm.

Scenario-2: In laboratory class by measuring the length of a piece of wood using an errorless slide callipers, Samin saw that main scale reading is 13.5 cm and vernier coincidence is 4. Total vernier scale divisions is 10.

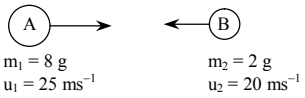
a. What is least count of a screw gauge? 1
b. Write down two differences between fundamental and derived quantities. 2
c. If the relative error in measuring the length of the cubic stone is 10%, determine the relative error in it's volume in the light of scenario-1. 3
d. The measurement in length of the piece of wood by the help of slide calliperse is more accurate and acceptable than ordinary scale– Analyze mathematically in the light of scenario-2. 4

2. ▶ For practice, a bowler threw a ball upwards with a velocity of 180 km/h. The ball rises to the highest height. In case of falling down, the table of time and velocity are given below:

Time(s)	0	1	2	3	4	5
Velocity (ms^{-1})	0	9.8	19.6	29.4	39.2	49

a. What is speed? 1
b. The motion of Halley's comet around the sun is periodic motion– Explain it. 2
c. Determine the maximum height of the ball from the earth surface. 3
d. Show with the help of graph acceleration–time that at falling down of the ball by the effect of acceleration due to gravity, it has created an amazing example of uniform acceleration. 4

3. ▶



A and B are two toy marble stone. At one stage of the game two marbles happen collision face to face and after the collision they continue to move at the uniform velocity.

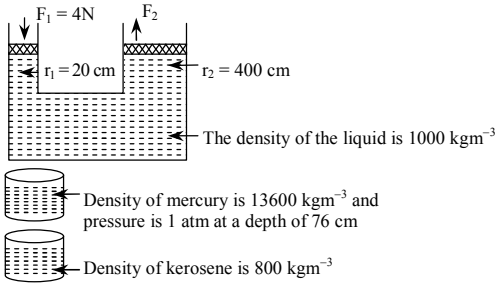
a. What is called velocity? 1
b. Why is it easier to walk on hard ground? 2
c. Determine the velocity and direction of the combine stones after collision. 3
d. Analyze mathematically whether the incident of the stem obeys the laws of conservation of momentum and kinetic energy. 4

4. ▶ Scenario-1: 100 Kg water is raised from a deep well of 10 m with a motor of efficiency of 49% in 20 sec.

Scenario-2: A heavy body is thrown in the upward direction with a velocity of 100 m/s.

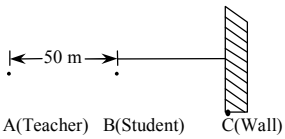
a. What is mechanical energy? 1
b. "The relationship of power to time spent in the same work is inversely proportional"– Explain it. 2
c. Determine the power of the motor mentioned in the scenario-1. 3
d. Analyze mathematically at what height potential energy and kinetic energy will be equal mentioned in the scenario-2. 4

5. ▶



a. What is strain? 1
b. Why does the density of matter decrease when the temperature increases? 2
c. Determine the value of force F_2. 3
d. Equal pressure of mercury is felt at different depths of the three liquids of the stem– Analyze mathematically. 4

6. ▶

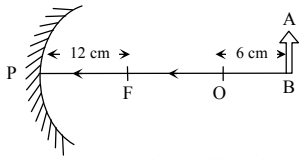


AB = BC and the velocity of sound in air is 350 ms^{-1}.

The teacher called a student in a loud voice. The frequency of the teacher's vocal cords is 700 Hz.

a. What is pitch of sound? 1
b. Why don't we hear all types of sound of environment? 2
c. Determine the wavelength of the sound called by the teacher. 3
d. Analyze mathematically who and how long after can hear the echo of sound of teacher's calling. 4

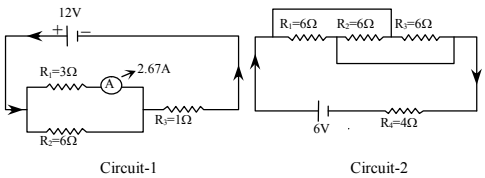
7. ▶



PF = OF, PF is focal length

a. What is diffused reflection? 1
b. When the magnifications value is greater than 1? 2
c. Determine the distance of the image of AB. 3
d. When the object and the image exchange their positions mentioned in stem and got from 'C' then by drawing ray diagram explain the nature, size and position of the image. 4

8. ▶



a. What is Rheostat? 1
b. Why does electric bill increase using filament is a bulb? Explain. 2
c. Determine the equivalent resistance of circuit-2. 3
d. Is the value of Ammeter obtained in circuit-1 correct? Analyze mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

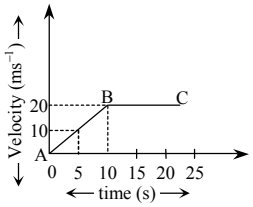
*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. 1 picometer = How much centimeter?
a 10^{-8} b 10^{-16}
c 10^{-12} d 10^{-10}

2. Determine the lenght of the rod. For measuring the rod use a Slide calipers scale and found the reading of main scale was 5 cm, Vernier divison is 7 and Vernier constant is 0.1 mm.
a 5.7 cm b 5.7 mm
c 5.07 mm d 5.07 cm

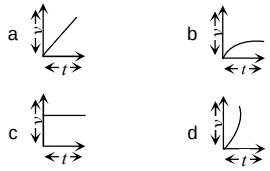
According to the figure answer the questions no. 3 and 4:



3. What is nature of velocity in AB part ine figure?
a Uniform acceleration
b Uniform velocity
c Uniform deceleration
d Non-uniform acceleration

4. In the graph–
i. BC part velocity is unchanged
ii. AB part acceleration is 2 ms^{-2}
iii. in first 20 second total travels distance is 200 m
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

5. Which graph shows the uniform acceleration of a moving object?



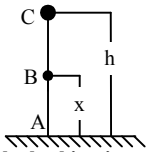
6. Velocity is a–
i. fundamental quantity
ii. vector quantity
iii. dimension = LT^{-1}
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

7. Following which one is scaler quantity?
a Force b Acceleration
c Energy d Electric intensity

8. Renewable energy source–
i. tide ii. solar energy
iii. biogas
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

9. Which one is the unit of elastic modulus?
a $kgms^{-2}$ b $kgms^{-3}$
c Nm^{-2} d Js^{-1}

According to the figure, answer the questions no. 10 and 11:



10. How much the kinetic energy gain the object at B point when it's falls freely from C point?
a 0 b mgx
c mgh d mg(h – x)

11. An object of mass m falls freely from C point–
i. object gain velocity
ii. velocity increase when distance increasing
iii. kinetic energy transfer to potential energy
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

12. How much power in Watt when a man of mass 70 kg climb in the hill of height 100 m for using 5 minutes? [g = 9.8 ms^{-2}]
a 3500 b 1400
c 228.67 d 0.14

13. Two bodies of equal volume but–
i. higher density has heavier
ii. lower dinsity has heavier
iii. lower density has lighter
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

14. The area of a small and bigger piston of hydraulic press is 10 cm^2 and 350 cm^2. How much force produce in bigger piston when 100 N force applied on the smaller piston?
a 20 N b 3500 N
c 5000 N d 10000 N

15. Which one happen when time period is greater of a particle in a wave?
a Decreasing frequency
b Inreasing frequency
c Stop frequency
d Frequency unchanged

16. What is the ratio of wave length of the waves that produce in two tuning fork of frequency 200 Hz and 800 Hz?
a 1 : 4 b 4 : 1
c 1 : 2 d 2 : 1

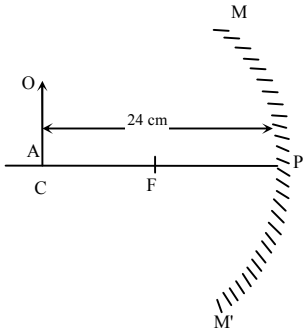
17. Which instrument used to catch the reflecting wave for determine the depth of the ocean?
a Geophone b Radar
c Telescope d Periscope

18. Which type of image not form in convex mirror?
a Virtual b Straight
c Real d Small in size

19. Why concave mirror use in telescope?
a For create clear image
b Magnification of the image
c Smaller image
d Image is upright

20. Which one is the unit of specific resistance?
a Ω m b Ω/m
c $(\Omega m)^{-1}$ d Ω/m^2

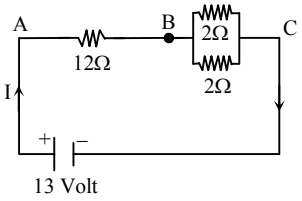
According to the figure, answer the questions no. 21 and 22:



21. What is the nature of the image of the object OA?
a Magnified
b Smaller
c Equal to the object
d Heavily magnified

22. For the image of the object OA–
i. position in between focus and radius of curvature
ii. linear magnification 1
iii. position in raidus of curvature
Which one is correct?
a i b ii
c ii and iii d i, ii and iii

According to the circuit, answer the questions no. 23 and 24:



23. How much equivalent resistance of the circuit?
a 3 Ω b 13 Ω
c 14 Ω d 16 Ω

24. How much electric power of the circuit?
a 1 W b 10.6 W
c 12.07 W d 13 W

25 How many times the kinetic energy of a definite mass when it's velocity replaced by twice time?
a Four time b Twice time
c Half d Equal

Ans.																									
	1	d	2	d	3	a	4	a	5	a	6	c	7	c	8	d	9	c	10	d	11	a	12	c	13	b
	14	b	15	a	16	b	17	a	18	c	19	a	20	a	21	c	22	c	23	b	24	d	25	a		

12. Rajshahi Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ Using a screwgauge the diameter of a sphere is found 2 mm from the main scale. 20th division of the circular scale coincides with the linear scale. Total number of division of the circular scale is 50 and the pitch is 0.5 mm. The mass of the sphere of Icc = 1gm.

a. What is fundamental unit? 1
b. Why it is necessary to know the dimension of a quantity? Explain. 2
c. The least count of the screwgauge mentioned in the stem express in meter. 3
d. If the relative error in the measuirement of diameter of the fixed mass sphere is 5%, then what will be the relative error in the measurement of density of the sphere? 4

2. ▶ In the following chart the velocity of a car along with time is given:

Time(s)	0	20	40	60	80	100	120
Velocity (ms^{-1})	0	4	8	12	12	6	0

a. What is circular motion? 1
b. Explain the adverse effects of energy conversion on the environment. 2
c. Determine the travelling distance of the car in 1 minute 20 sec. 3
d. Analyze the change in acceleration in different parts by drawing a graph of the velocity of the car versus time. 4

3. ▶ A player kicks a football of mass 450 gm at a speed of 24 ms^{-1} and gives it to another player at 48 m far. He flipped the football 8 m away towards the goal at a speed at 9 ms^{-1}. The co-efficient of friction of motion is $\frac{30}{49}$.

a. What is called inertia of rest? 1
b. How the parachute rider safely landed on the ground? Explain. 2
c. In the light of stem determine the kinetic energy of the football at the time of flipping. 3
d. Whether it is possible to be goal in the light of stimuli? Mathematically analyze. 4

4. ▶

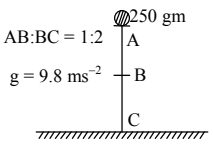


Fig: 1

If the body is fallen freely 10 sec is required to reach at the point B.

a. What is the efficiency? 1
b. Cooking oil is renewable energy– Explain. 2
c. Estimate the work done to displace the body from C to A. 3
d. In the light of stem total energy of the body is constant at points A, B and C analyze it mathematically. 4

5. ▶ A wooden piece having 40 cm length, 20 cm breadth and 10 cm height floated in the river water and went to sea. The wooden piece was half submerged in the river water. The mass of the piece was 4 kg and density of sea water 1.03×10^3 Kg/m^3.

a. Write down Pascal's law. 1
b. Why cooking in a pressure cooker is quick? 2
c. Determine the maximum pressure of wooden piece on a floor. 3
d. What percentage of the wooden piece would float in sea water? Analyze mathematically. 4

6. ▶ The effective lenght of rod of a pendulum clock of mass 2.45 kg is 100 cm. The clock is taken at height 900 km in space. R = 6000 km, g = 9.8 ms^{-2} and $\pi = \frac{22}{7}$.

a. What is called transverse wave? 1
b. Why astronauts float in space? Explain. 2
c. Determine the spring constant of the pendulum clock on the surface of the earth in the light of stem. 3
d. In the light of stem how long will the clock run slowly in one day in space? Analyze mathematically. 4

7. ▶ An object is placed at a distance of 15 cm from the pole of a concave mirror of 20 cm radius.

a. What is called image? 1
b. Why the side change in the image of 'M' in a plane mirror is not understood? 2
c. Determine the position, nature and size of the object using ray diagram. 3
d. If there is any change in magnification by advancing 10 cm to the mirror? Analyze mathematically. 4

8. ▶

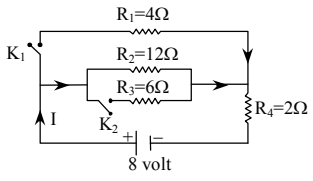


Fig: Circuit

a. What is variable resistance? 1
b. Write down two differnces between direct current and alternating current. 2
c. Determine the equivalent resistance of the circuit mentioned in the stem when both of two switches is in on state. 3
d. Whenever the electric current of R_1 when two switches are in on state is qual to the current of R_1 when K_2 switch is in off state? Analyze mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. What is the dimension of density?
a L^3 b $M^{-1}L^3$
c ML^3 d ML^{-3}

2. What times the resistance if the conductor is pulled and doubled?
a 0.5 b 2
c 4 d 6

3. Concave mirror is used–
i. for medical equipment
ii. for telescope iii. daily use
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

4. Example of periodic motion–
i. water wave
ii. vibrational motion of heart
iii. hands clock
Which one is correct?
a i and ii b ii and iii
c ii and iii d i, ii and iii

5. Which one of the following is neno second?
a 10^{-6} sec b 10^{-9} sec
c 10^{6} sec d 10^{9} sec

6. The example of derived quantity is–
i. power
ii. electric intensity
iii. luminous intensity
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

7. How many fundamental forces exist in nature?
a 2 b 3
c 4 d 5

Read the stem below and answer to the questions no. 8 and 9:

A boy passed $\frac{3}{4}$ of circumference of a circular path of radius 20 m.

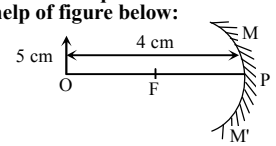
8. What is the displacement of the boy?
a 28.28 m b 60 m
c 94.248 m d 942.48 m

9. The above stem indicates the boy's–
i. velocity ii. speed
iii. periodic motion
Which one is correct?
a i b i and ii
c ii and iii d i, ii and iii

10. If in a chain reaction in fission process 1 kg mass is decreased the emitted power will be–
a 9×10^{19} J b 9×10^{16} J
c 4.5×10^{6} J d 3×10^{8} J

11. Which one from below is the most common form of energy?
a Heat energy
b Mechanical energy
c Light energy
d Electric energy

Answer to the questions no 12 and 13 with the help of figure below:



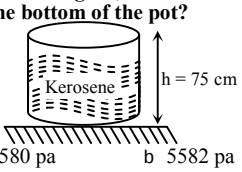
12. What is the lenght of the image of the object?
a 2 cm b 4 cm
c 5 cm d 10 cm

13. Which of the followiong is correct according to the above figure?
a $r = \frac{f}{2}$ b $f = \frac{r}{2}$
c $m = \frac{l}{l^-}$ d $\frac{1}{u} - \frac{1}{v} = \frac{1}{f}$

14. In which of the following two objects gravitational force acts between–
a moon and sun
b earth and book
c mercury and venus
d chair and table

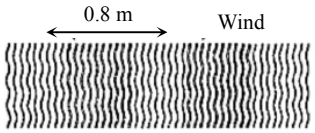
15. When a person used a hand fan for blowing wind what happened for that person?
a Mechanical energy is converted to sound energy
b Nuclear energy is converted to Mechanical energy
c Chemical energy is converted to Mechanical energy
d Chemical energy is converted to heat energy

16. If ρ = 800 kg/m^3, what is the pressure on the bottom of the pot?



a 5580 pa b 5582 pa
c 5880 pa d 5889 pa

Answer to the questions no 17 and 18 with the help of stem:



17. What is the frequency in Hz of the source S?
a 850 b 425
c 273 d 136

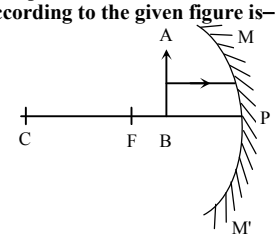
18. When the velicity of sound increases then the medium–
i. the pressure of air will increase
ii. the temperature will rise
iii. the velocity will increase with the increases of density
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

19. Which has no free electrons?
a Conductor
b Insulator
c Semi conductor
d Super conductor

20. Equilibrium force is effected–
i. when a ship floats on water
ii. when an object falls from top to bottom
iii. when a person is sitting in a chair
Which one is correct?
a i and ii b ii and iii
c ii and iii d i, ii and iii

21. How many farad is equal to one pico farad?
a 10^{-15} b 10^{-12}
c 10^{12} d 10^{15}

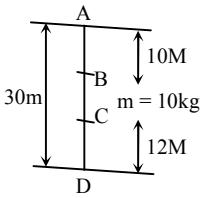
22. The position and nature of the image according to the given figure is–



a straight and in front of the mirror
b reverse and behind the mirror
c virtual and magnified
d real and magnified

23. $T = 2\pi\sqrt{\frac{l}{g}}$, T = time period, l = lenght of string, g = Acceleration due to gravity
In the above stem, when the time period will be maximum?
i. If increases the mass of pendulum
ii. If increases the length of string
iii. If decreases the value of 'g'
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

Answer to the questions no 24 and 25 with the help of figure below:



24. If the mass of the object is 10 kg, how many joules of potential energy at point A?
a 2940 J b 2900 J
c 2840 J d 2800 J

25. Which of the following is correct according to the figure?
a The potential energy at the point C is more than the point B
b When an object touch the ground then the total energy will be converted into kinetic energy
c The potential energy at the point C is less than point B
d The kinetic energy at the point C is less than the point B

Ans.																									
	1	d	2	b	3	a	4	b	5	a	6	c	7	c	8	c	9	b	10	b	11	b	12	c	13	b
	14	b	15	c	16	c	17	b	18	b	19	b	20	c	21	b	22	c	23	b	24	a	25	*		

** [N.B. 25. Both b & c are correct.]*

13. Dinajpur Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The length, width and height of an object found 20cm, 10cm and 10 cm respectively by using a slide calipers. The value of minimum division of main scale is 1mm and Vernier constant is 0.05 mm. 5% relative error was found by measuring the length of the fragment by dividing the object perpendicularly along the width.

a. What is screw pitch? 1
b. Why slide calipers are more suitable for accurate measurement of an object than meter scale? 2
c. Determine the number of division of Vernier scale. 3
d. Is there any change in relative error in measuring the volume of the fragmented part? 4

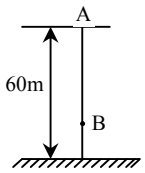
2. ▶ Two pieces of stones of mass 120gm and 200gm respectively were hit on a high roof of building at speeds of 29.4ms^{-1} and 20ms^{-1} respectively. The height of building is 14m.

a. What is called acceleration? 1
b. Why is the acceleration of an object moving in the uniform velocity zero? Explain it. 2
c. What is the value of the velocity of the first object? 3
d. Which object will hit the roof more? Give your opinion with mathematical logic. 4

3. ▶ A loaded car of 12,000 kg and an empty car of 800 kg run along the same straight line at a speed of 12ms^{-1} and 20ms^{-1} from a distance of 800m respectively. After a while they collided with each other.

a. Write down the Newton's second laws of motion. 1
b. Why is it difficult to walk on the sand? Explain it. 2
c. After how long will there be a collision between them? 3
d. Which of the two cars will be more damaged? Explain it mathematically. 4

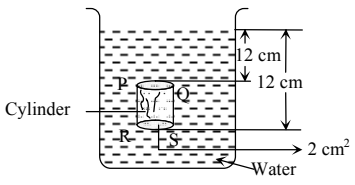
4. ▶



A piece of stone of mass 2 kg falls freely from the point A. This stone exceeds the pount B with velocity 29.4 ms^{-1} and it touches the ground at certain time.

a. What is called efficiency? 1
b. Why does the velocity of the throuwn object decrease gradually? Explain it. 2
c. Determine the distance between A and B. 3
d. Is the potential energy at A and the mechanical energy at B be equal? Give mathematical logic. 4

5. ▶



a. What is called density? 1
b. Why does the air bubble rising from the bottom of the reservior get bigger? 2
c. Determine the water pressure at the bottom of the cylindeer. 3
d. Whether the weight of the liquid removed by the PQRS object will be equal to the weight lost by the object, explain it mathematically. 4

6. ▶ One man standing in front of a high rise building produced a sound of frequency 250 Hz. The temperature at that day was 35°C. The distance between the source of sound and the building is 17.5m.

a. What is called wave? 1
b. Why does the velocity of sound vary in air medium? 2
c. Determine the wave length of the produced sound. 3
d. Is it possible to hear echo at that person? Explain it with mathematical explanation. 4

7. ▶

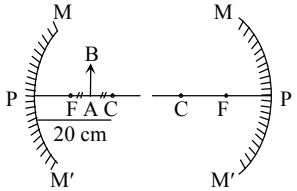
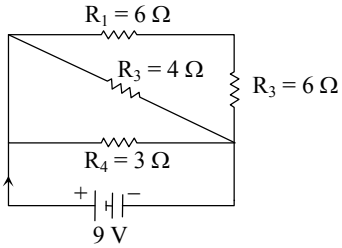


Fig-1 **Fig-2**

a. What is focal point? 1
b. Why do the leaves of the tee look balck in the red light? 2
c. Determine the distance of the image of object AB. 3
d. Which figure of the stem is used to see the rear view of a vehicle? Explain wity ray diagram. 4

8. ▶



a. What is electromotive force? 1
b. Why nichorme wire is used in electric iron? 2
c. Determine the flow of current through R_4. 3
d. Will the bulb glow brightly if a bulb of 60W is connected to the circuit instead of the resistors? Explain mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

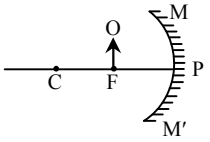
Candidates are asked not to leave any mark or spot on the question paper.

1. Which one of the following is the fundamental quantity?
a Heat b Energy
c Temperature d Conductivity

2. Light energy is converted into which energy for photoelectric effect on photographic plate?
a Electrical energy
b Sound energy
c Mechanical energy
d Chemical energy

3. Which one is the weakest force among the fundamental forces?
a Gravitational force
b Electromagnetic force
c Weak nuclear force
d Strong nuclear force

Answer the questions no. 4 and 5 in the light of figure below:



4. The image of 'O' will be —
i. in infinity
ii. in between C and F
iii. extremely magnified
Which one is correct?
a i and ii
b ii and iii
c i and iii
d i, ii and iii

5. If the object is in between C and F, then image will be —
a real, upright and big
b real, upright and small
c real, inverted and big
d virtual, upright and small

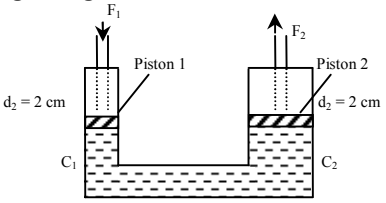
6. Which one is the source of the renewable energy?
a Gas b Coal
c Nuclear d Geothermal

7. The repulsive force is —
i. gravitational force
ii. magnetic force
iii. electrical force
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

8. What is the dimension of acceleration?
a LT^{-1} b LT^{-2}
c L^2T^{-1} d L^2T^{-2}

9. Which force will feel a marble, if it goes through glycerin?
a Static friction
b Sliding friction
c Rolling friction
d Fluid friction

Answer the questions no. 10 and 11 in the light of figure below:



10. If 15 Pa pressure is implied on the piston no. 1—
i. 30 Pa pressure will be implied on the piston no. 2
ii. pressure will be affected everywhere
iii. 15 Pa pressure will be implied on the wall of the pot
Which one is correct?
a i and ii
b ii and iii
c i and iii
d i, ii and iii

11. What is the value of force on piston no. 2?
a F_1
b $\frac{F_1}{2}$
c $2F_1$
d $4F_1$

12. For safe and perfect driving which is the most necessary?
a Cleaning the glasses of car
b Using petrol as fuel
c Properly adjust the mirror
d Keep the light on all the time

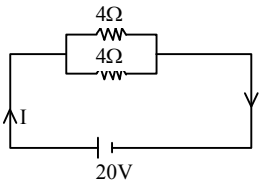
13. Which one is used as the fuel in nuclear reactor?
a Neutron
b Krypton
c Barium
d Uranium

14. What is the density of human body?
a 0.25 gm/cc
b 0.45 gm/cc
c 0.99 gm/cc
d 2.60 gm/cc

15. In nuclear rector —
i. there is control rod
ii. huge amount of heat energy is radiated
iii. uranium is used as fuel
Which one is correct?
a i and ii
b ii and iii
c i and iii
d i, ii and iii

16. What is the unit of intensity of sound?
a s^{-1}
b Hz
c ms^{-1}
d Wm^{-2}

Answer the questions no. 17 and 18 in the light of figure below:



17. What is the equivalent resistance of the circuit?
a 1Ω b 2Ω
c 4Ω d 8Ω

18. What is the current flow through the circuit?
a 0.4 Amp b 2.5 Amp
c 5 Amp d 10 Amp

19. What is the Young's modulus of Copper?
a 50 G-Pa b 69 G-Pa
c 1176 G-Pa d 200 G-Pa

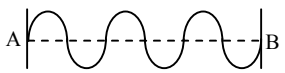
20. What is the second law of falling body?
a $v \propto t$
b $v \propto g$
c $h \propto t$
d $h \propto t^2$

21. The front part of pin is sharp —
i. to increase the pressure
ii. to increase the force
iii. to get more mechanical advantage
Which one is correct?
a i and ii
b ii and iii
c i and iii
d i, ii and iii

22. The length of a conducting wire is 2 meter, cross sectional area $6\times10^{-8}m^2$ and resistivity $1.68\times10^{-8}\Omega$-m. What is the resistance?
a 0.056Ω b 0.56Ω
c 1.78Ω d 3.57Ω

23. The specific resistance of which one is less?
a Copper b Graphite
c Silver d Gold

24.



The wave takes 6 second time to cover the distance showed in above figure. What is the frequency of the wave?
a 0.166 Hz b 0.5 Hz
c 1 Hz d 2 Hz

25. Which one of the following is vector quantity?
a Displacement
b Distance
c Time
d Speed

Ans.																									
	1	c	2	d	3	a	4	b	5	c	6	d	7	c	8	b	9	d	10	c	11	d	12	c	13	d
	14	c	15	d	16	d	17	b	18	d	19	c	20	a	21	b	22	b	23	c	24	b	25	a		

14. Cumilla Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ Look at the two figures and answer the questions:

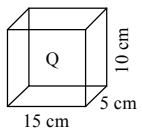


Figure-Q: Solid Object

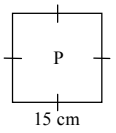


Figure-P: Square Object

a. What is dimension? 1
b. What do you mean by pitch of a screw gauge is 0.01 mm? Explain. 2
c. How much relative error in area in P object that shown in the figure? 3
d. How much percentage of error presence in volume in Q object that shown in the figure? 4

2. ▶ The graph shows the nature of applied force on the cycle:

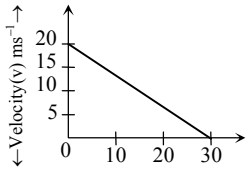


Fig: A

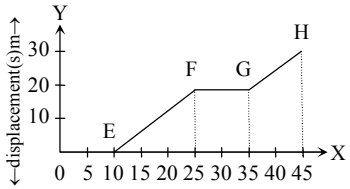


Fig: B

a. What is velocity? 1
b. Why uniform speed not shows uniform velocity but uniform velocity shows uniform speed? Explain. 2
c. Determine the cycle travels distance from figure-A. 3
d. Analyze the different position's velocity while moving the cycle that shows in figure-B. 4

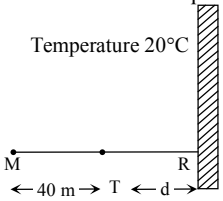
3. ▶ Driver push force on the break to shows a passenger that is 62 m away from a bus of 1000 kg with velocity 180 kmh^{-1}. For this reason the bus stopped just 200 cm away from the passenger.

a. Write down the conservation law of momentum. 1
b. Friction is very essential in our every day life.– Explain. 2
c. Determine the braking force of the bus. 3
d. For avoid accident, how much maximum initial velocity is essential when the deacceleration is same– Analyze mathematically. 4

4. ▶ 400 gm mass of a object-M is falls from a building of height 100 m. At the same time, 200 gm mass of an object-N is thrown vertically upward with velocity 20 ms^{-1}.

a. What is work? 1
b. Why geothermal is a renewable energy? Explain. 2
c. At which place from the ground where the M-object kinetic and potential energy is same? 3
d. Total energy is unchanged at the thrown time of object 'N' and after 2 sec of thrown– Explain with mathematically. 4

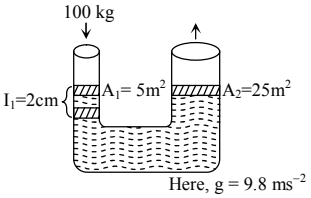
5. ▶ Look at the figure and answer the questions:



A man stand at 'M' Possition, creates a sound and after 0.5 s he hears the reflected sound. [At 0°C temperature the velocity of the sound is 330 ms^{-1}]

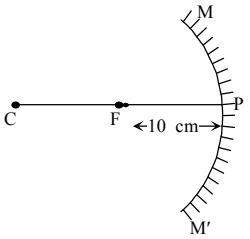
a. What is frequency? 1
b. Explain the effect of air density on the velocity of the sound. 2
c. Determine the reflecting distance from R to M. 3
d. Whether it is possible to hear the echo when a man stands at position T. Give your opinion with mathematical analysis. 4

6. ▶ Look at the figure and answer the questions:



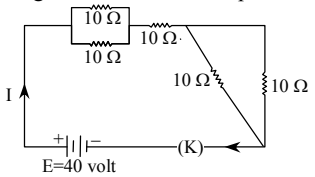
a. What is strain? 1
b. Explain for flying fanus it is essential to change density of air. 2
c. How much upward force create in the bigger piston? 3
d. Whether it is possible to displace upward 3 cm in case of bigger pistion– Explain mathematically. 4

7. ▶ Look at the figure and answer the question:



a. What is focus length? 1
b. Which kind of color shows the tree leaf in red light? Expalin. 2
c. Determine the distance of the image when the object place 15 cm away from the pole of the mirror. 3
d. Explain with ray diagram the position, size and nature of the image when the object place greater than 20 cm away from the pole of the mirror. 4

8. ▶ Look at the figure and answer the questions:



a. What is resistnace? 1
b. Why the resistance is greater in thin wire compare to thick wire? Explain. 2
c. Determine the equivalent resistance of the circuit. 3
d. Compare the current of the present circuit and rearranging the resistace which is more suitable in house when the electromotive force is constant. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. What is called the displacement of screw gauge?
a Error
b Least count
c Vernier constant
d Pitch

2. Which one of the following is the multiple of force and velocity?
a Work b Energy
c Power d Momentum

3. If a freely falling body travels 50 m in 5 sec then how much time in second will need to travel the distance of 72 meter?
a 6 b 7.2
c 9.5 d 12

4. Which one is the minimum sub-multiple used in S.I unit?
a Peta b Femto
c Nano d Micro

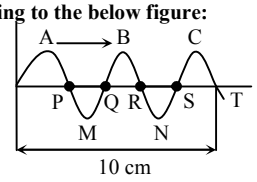
5. As high as someone goes up from the sea level of the surface–
i. the weight of atmosphere increases
ii. the density of air decreases
iii. the pressure of air decreases
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. Which one of the following has more conductivity?
a Copper b Silver
c Tungsten d Nichrom

7. If the Vernier constant of any slide calipers is 0.005 cm then how many divisions are there in scale? [The smallest division of main scale is 1 mm]
a 5 b 10
c 20 d 200

8. Which of the following is inconsistent with a concave mirror?
a View mirror
b Dental treatment
c Torch light
d Telescope

Answer the questions no. 9 and 10 according to the below figure:



9. What is the wave length of the wave in cm?
a 2 b 4
c 5 d 10

10. At which point in the figure is the energy of wave generating particle maximum?
i. A, Q ii. P, R
iii. M, C
Which one is correct?
a i b ii
c iii d i and iii

11. Which one is the unit of spring constant?
a Nm^{-1} b Js^{-2}
c kgm^{-2} d Jm^{-2}

12. How much mA of current will cause death to human if it flows through the human heart?
a 240 b 220
c 10 d 1.5

13. An electric motor of 500W lifted an object of mass 15 kg at height of 20 m in 10 sec. How much energy is wasted?
a 2060 J b 2940 J
c 500 J d 7500 J

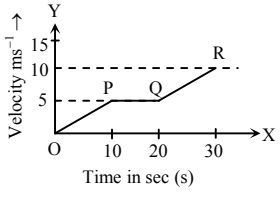
14. Which of the following will be unchanged during the propagation of wave in different medium?
a Wave length b Wave velocity
c Wave speed d Frequency

15. The resultant of which force is zero?
a Balanced force
b Unbalanced force
c Tactile force
d Non tactile force

16. What is called the rate of change of distance?
a Displacement b Velocity
c Speed d Acceleration

17. Keeping the flow of courrent unchanged if the time is increased then the flow of current will be–
i. increased ii. decreased
iii. unchanged
Which one is correct?
a i b ii
c i and ii d ii and iii

Answer the questions no. 18 and 19 according to the figure:

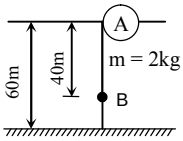


18. What is the distance of OP in meter?
a 100 b 50
c 25 d 4

19. In above figure–
i. the uniform acceleration of the vehicle exists at OP and OQ
ii. the change of velocity at P and R is equal
iii. distance PQ = 50 m
Which one is correct?
a ii b i and iii
c i and iii d i, ii and iii

20. The reason of illuminated of the whole house is–
i. regular reflection
ii. total internal reflection
iii. irregular reflaction
Which one is correct?
a i b ii
c iii d i, ii and iii

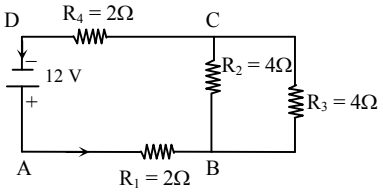
21.



i. The potential energy at A > the potential energy is at B
ii. The kinetic energy at A < the kinetic energy at B
iii. The potential energy at A = the potential energy at B
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

22. Which has the minimum elasticity?
a Bone b Wood
c Glass d Aluminium

Answer the following questions no. 23 and 24 according to the figure:



23. What is the potential difference at point D?
a 0 V b 4 V
c 8 V d 12 V

24. According to the figure–
i. the potential at C is half of the potential at B
ii. The flow at current across R_2 is two times of the flow of current across R_3
iii. The power of circuit is 24W
Which one is correct?
a i b ii
c iii d i, ii and iii

25 Which musical instrument is made with the flow of air?
a Violin b Harmonium
c Setar d Drums

Ans.																									
	1	d	2	c	3	a	4	b	5	c	6	b	7	c	8	a	9	b	10	c	11	a	12	c	13	a
	14	d	15	a	16	c	17	b	18	c	19	*	20	c	21	a	22	a	23	a	24	*	25	b		

* ***[N.B.:** 19 (ii) & (iii) are Correct.]* * ***[N.B.:** 24 (i) & (iii) are Correct.]*

15. Chattogram Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

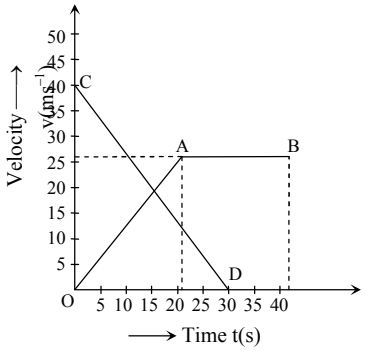
1. ▶ **Scene-1:** The diameter of a wire is measured by a screw gause is given below:

Linear scale reading (mm)	Circular scale division	Least Count (mm)
05	14	01

Scene-2: The length of a cube is 8 cm. The relative error in the measurement of length is 5%.

a. Define pitch. 1
b. Explain the necessity of dimensions of equation. 2
c. Determine the cross sectional area of a wire using scene-1. 3
d. Determine the percentage of relative error in the measurement of volume using scene-2. 4

2. ▶ The graph shows velocity-time for first car line is OAB and second car is CD.

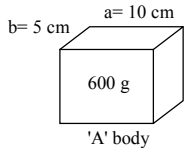


a. Define harmonic motion. 1
b. In this universe all rest and all motion are relative– Explain. 2
c. Determine the acceleration of the first car. 3
d. After 30 seconds compare the distance between the two cars and give your personal opinion. 4

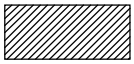
3. ▶ Two electric motor do the work together which same energy is 1500 jule. A motor is used to lift a body of weight 15 kg at a hight 8 m and another is used to lift a body of weight 12 kg at a hight 10 m. [$g = 9.8\ ms^{-2}$]

a. What is conservation of energy? 1
b. Why biomass is called the source of renewable energy? Explain. 2
c. Calculate the efficiency of the first motor. 3
d. Analyze the energy transformation the two motors in view of energy conservation law. Give your opinion with mathematical analysis. 4

4. ▶



'A' body



B = A gold bar which weight is 10 g in air and 9.48g when immersed in water. [Real density of gold is 19300 kg/m^3]

Which density 1.05 gm/cm^3

a. What is stress? 1
b. Which one is more painful to walk bare footed on plain bricks soling road or a brick chucked road? Explain. 2
c. Calculate the applied pressure by the body 'A' on surface ab. 3
d. Is the gold bar made by pure gold or not? Mathematically analyze. 4

5. ▶

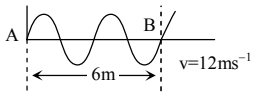
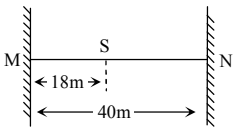


Fig-1: wave

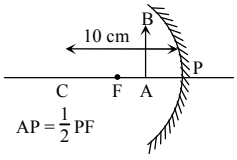


The velocity of the generated sound is 350 ms^{-1} in the point of S.

Fig-2

a. What is frequency? 1
b. Why is a minimum distance necessary to hear an echo? 2
c. Determine the frequency of the wage by the light of fig-1. 3
d. According to fig-2, if a person makes a sound at point S, will he hear echo? Give the mathematical logic. 4

6. ▶



Magnification m = 0.7

a. Define magnification. 1
b. Why rays incident normally on the mirror turns back along the same path? 2
c. Determine the length of object when the image length is 7 cm. 3
d. Show that mathematically determinated position and nature of the image are same as the ray diagram position and nature of the image. 4

7. ▶ A body of mass 800g is thrown in the upward direction with a velocity of 200 ms^{-1}. [Exhusted by wind]

a. What is rolling friction? 1
b. Why is the frictional force grnereted? 2
c. At what height the potential and the kinetic energy will be same? 3
d. After 20s of throwing and after 30s of falling, will the total energy same? Explain the reasons. 4

8. ▶

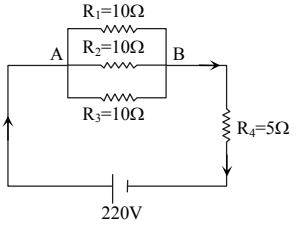


Fig-1

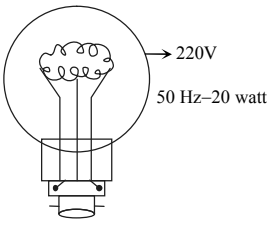


Fig-2: A bulb

a. Write down the Ohm's law. 1
b. What do you mean by the electromotive force of a dry cell is 1.5V? 2
c. If the bulb of the fig-2 is used everyday for 6 hours for 30 dyas, then what sould be the electric energy usage? If each unit has a price of 8 Taka, then what will be the total cost for this? 3
d. If the resistors R_1, R_2 & R_3 of fig-1 are connected in series, what will be the change in current compared with fig-1? 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. Which of the following symbols is the source of AC?

a b 

c  d 

2. If a sound with 2 KHz passes through an iron pipe in 5130 ms^{-1} velocity, what will be the wavelenght of that sound?

a 0.38 m b 1.28 m

c 2.57 m d 5.13 m

3. The specific resistance of a conductor will change if–

i. the conductor's length changes

ii. temperature changes

iii. material changes

Which one is correct?

a i b iii

c i and ii d ii and iii

4. What is the velocity of sound in Mercury?

a 1284 ms^{-1} b 1450 ms^{-1}

c 1493 ms^{-1} d 12000 ms^{-1}

5. If a moving fan is switched off, what will be the type of motion of the blades of the fan?

a Circular b Periodic

c Translational d Harmonic

6. Pascal is the unit of which quantity?

a Stress b Strain

c Kinetic energy d Buoyancy

7. The atmospheric pressure of a certain place is 93296 Pa. Density of kerosene is 800 kgm^{-3} and density of benzene is 980 kgm^{-3} in that place. Which one is correcet?

a Height of Mercury column is 76 cm

b Height of water column is 9.52 m

c Height of kerosene column is 9.71 m

d Height of benzene column is 11.9 m

8. Who gave correct mathematical explanation of Quantum Theory of rediation?

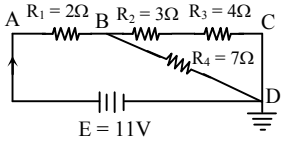
a Einstein

b Satyendra Nath Bose

c Max Planck

d Maxwell

Answer to the questions no, 9 and 10 on the basis of the following circuit:



9. What is the equivalent resistance of the circuit?

a 3.94Ω b 5.5Ω

c 8.1Ω d 8.55Ω

10. In the above circuit–

i. current of R_2 and R_4 is same

ii. the potential difference of R_3 is more than that of R_2

iii. potential at point B is 7V

Which one is correct?

a i b ii

c i and iii d i, ii and iii

11. What is the fuel of fusion?

a Helium b Hydrogen

c Uranium d Water

12. Which of the following has more specific resistance?

a Silver b Copper

c Gold d Graphite

13. Which friction one faces while swimming?

a Static b Sliding

c Rolling d Fluid

14. A player throws a ball up with the velocity 72 Kmh^{-1} vertically. What will be the maximum height the ball will travel?

a 40.81 m b 20.41 m

c 14.69 m d 7.34 m

15. Which has least elasticity?

a Wood b Glass

c Bone d Aluminium

16. Which two fundamental forces form electroweak force?

a Gravitational force and electrical force

b Strong nuclear force and weak nuclear force

c Electromagnetic force and weak nuclear force

d Gravitational force and strong nuclear force

17. Which is non-renewable energy?

a Nuclear b Biogas

c Hydroelectricity d Geothermal

18. What colour a red rose turn into in red colour?

a Red b Pink

c Green d Blue

19. Which scientist first gave the idea of the solar centric solar system?

a Galileo b Copernicus

c Aristarchus d Seleucus

20. Motion of the vibration of an atom–

i. linear motion ii. periodic motion

iii. harmonic motion

Which one is correct?

a i b iii

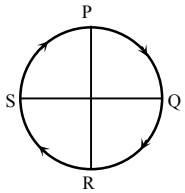
c ii and iii d i, ii and iii

21. If absolute errors are equal. Which books lenght's relative error will be more? The length–

a 10 cm b 15 cm

c 20 cm d 25 cm

22.



An object moving in uniformed speed travels on PQRS path. If it reaches P point from P, at which point its average velocity will be minimum?

a P point b Q point

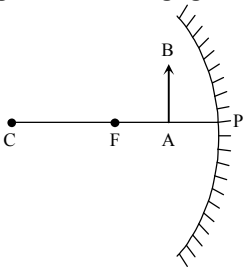
c R point d S point

23. What is the dimension of pressure?

a ML^{-3} b ML^2T^{-3}

c ML^2T^{-2} d $ML^{-1}T^{-2}$

Answer to the questions no. 24 and 25 in light of the following figure:



24. If the radius of the mirror PC = 40 cm and the distance between the mirror and the object is 10 cm, what is the distance of the image?

a 50 cm b 40 cm

c 20 cm d 10 cm

25 The image of the object AB–

i. shape is magnified

ii. position is behind the mirror

iii. nature is real

Which one is correct?

a i b iii

c i and ii d i, ii and iii

Ans.																											
	1	c	2	c	3	d	4	b	5	a	6	a	7	b	8	c	9	b	10	c	11	b	12	d	13	d
	14	b	15	c	16	c	17	a	18	a	19	b	20	c	21	a	22	a	23	d	24	c	25	c		

16. Sylhet Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The length of a bar is 18 mm measured by a simple scale. The vernier coincidence has got 14 when the length of the bar measured by a slide callipers of vernier constant of 0.005 cm.

a. What is fundamental quantity? 1

b. "Power is a derived quantity."– Explain. 2

c. Determine the number of divisions of vernier scale as the stimulate information. 3

d. What will be the lenght of the bar by the slide callipers mentioned in the stem? 4

2. ▶

Time t(s)	0	2	4	6	8	10	12	14	16
Velocity v(ms^{-1})	0	5	10	15	15	15	10	5	0

a. What is called uniform velocity? 1

b. Will your weight be same in all the countries of earth? Explain. 2

c. Determine the distance covered in first 6s in the light of stimulate information. 3

d. Draw a graph in the light of given information and analyze the nature of velocity of different parts. 4

3. ▶ A force is applied on an object of weight 58.8 N for 10 second. As a result the object covers 50m distance on a floor with 2N frictional force. After withdrawing the force the object stopped after a while due to the frictional force.

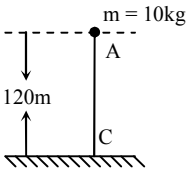
a. What is inertia? 1

b. Why retardation is a derived quantity? 2

c. Calculate the applied force on the stimulate object. 3

d. How much distance will cover the object after with drawing the force? 4

4. ▶



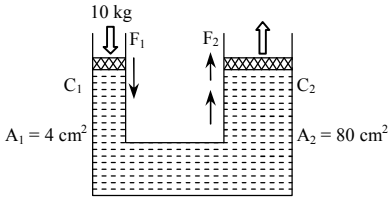
a. What is potential energy? 1

b. Why is control rod used in nuclear reactor? 2

c. With what velocity the object hit the point C, if it is falling from A freely? 3

d. At which height from ground the potential energy will be double of the kinetic energy? Give opinion with mathematical analysis. 4

5. ▶



a. What is stress? 1

b. What is meant by Torricelli's vacuum? 2

c. How much upward force will act on C_2 piston, if 10 kg mass kept on C_1 piston? 3

d. How will be the graph of (F_1 Vs F_2) if 1N, 2N and 3N forces are applied on C_1 piston? Show it. 4

6. ▶ The velocity of sound in medium P and Q are 350 ms^{-1} and 400 ms^{-1}. The difference of wavelengths in two mediums is 0.4 m.

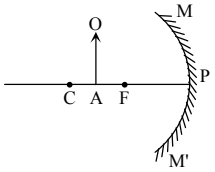
a. What is wave? 1

b. "Water wave is a transverse wave"– Explain. 2

c. Determine the wavelength in medium P. 3

d. What will be the difference of distance covered by the sound for 40 vibration in P and Q medium? Analyze mathematically. 4

7. ▶



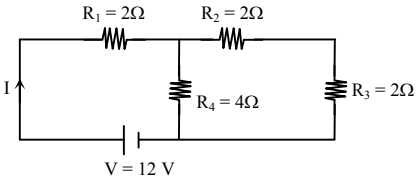
a. What is principal axis? 1

b. Why it is imposible to form real image in convex mirror? 2

c. How will be the image of the stimulate object? Discuss. 3

d. Is it possible to be the linear magnification = 1? Give your opinion with ray diagram. 4

8. ▶



a. What is specific resistance? 1

b. Why system loss is occurred? Explain. 2

c. Determine the equivalent resistance of the circuit. 3

d. "The electric current are different, though the value of R_1 and R_2 are same."– Evaluate the validity of the speech. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. 1 Tera = ?
a 10^{15} b 10^{12}
c 10^{-12} d 10^{-15}

2. Which one is non-renewable energy?
a Nuclear energy b Air energy
c Biofuel d Geothermal

3. If an object does not have acceleration–
i. Work W = 0
ii. Force F = 0
iii. Initial velocity u = Final velocity v
Which one is correct?
a i b ii
c i and ii d i, ii and iii

4. If the length of a rod is (12 ± 0.05) cm, what will be the relative error of the length measurement?
a 12.05 b 11.95
c 0.42 d 0.0042

5. What is the unit of power?
a kgm^2s^{-3} b kgm^2s^{-2}
c $kgms^{-2}$ d $kgm^{-1}s^{-2}$

6. If 2 ms^{-2} acceleration is applied to an object in rest, what time will it take to get 20 ms^{-1} velocity?
a 0.1 s b 10 s
c 18 s d 40 s

Answer to the questions no. 7 and 8 in light of the information given below:
If an object of 2 kg mass in rest is dropped from above, it falls 36 m in 3 s.

7. What is the acceleration of the object?
a 4 ms^{-2} b 4.9 ms^{-2}
c 8 ms^{-2} d 9.8 ms^{-2}

8. In that event–
i. fluid friction is 3.6 N
ii. travelled distance in 6s is 72 m
iii. velocity after 3 s is 29.4 ms^{-1}
Which one is correct?
a i b iii
c i and ii d i, ii and iii

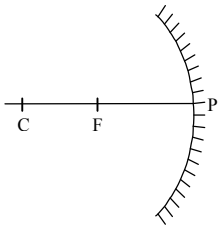
9. Which of the following is right based on stronger force?
a Electromagnetic > Strong Nuclear > Weak Nuclear > Gravitational
b Strong Nuclear > Electromagnetic > Weak Nuclear > Gravitational
c Gravitational > Weak Nuclear > Strong Nuclear > Electromagnetic
d Weak Nuclear > Gravitational > Electromagnetic > Strong Nuclear

10. Which one is the dimension of stress?
a $ML2T^{-3}$ b ML^2T^{-2}
c $ML^{-1}T^{-2}$ d MLT^{-2}

11. Bats while flying use the property of sound–
a reflection b refraction
c interference d super position

12. 20J more energy is applied to a moving object of 10 kg mass and 5 ms^{-1} velocity towards the direction of the motion. What will be the velocity of the object?
a 3.8 ms^{-1} b 5.39 ms^{-1}
c 14.5 ms^{-1} d 29 ms^{-1}

13.



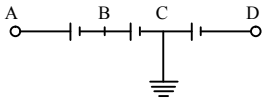
If an object is placed on F point, what will be the magnification of the image?
a Less than 1 b Greater Than 1
c Equal to 1 d Infinity (∞)

14. Which colour has the least wave length?
a Violet b Blue
c Green d Red

15. If 4 bulbs of 12 V – 3W are connected in a series, what will be the equivalent resistance?
a 0.021Ω b 0.25Ω
c 48Ω d 192Ω

16. Which one is scalar quantity?
a Displacement b Work
c Force d Acceleration

17.

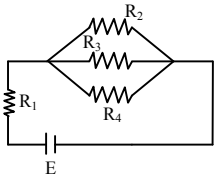


E = 3V for each cell
Which of the following is correct?
a Potential of point A – 6V
b Potential of point B – 3V
c Potential of point C 0V
d Potential of point D + 3V

18. When you bring down a set of books kept on a high self by your hands, then–
i. the work done by you is positive
ii. the work done by gravitational force is positive
iii. the books absorb energy from you
Which one is correct?
a i b ii
c i and iii d i, ii and iii

19. Which of the following is the weakest frictional force?
a Static Friction b Sliding Friction
c Rolling Friction d Fluid Friction

Answer to the question no. 20 and 21 in light of the following diagram:



$R_1 = R_2 = R_3 = R_4 = 9\Omega$
E = 6V

20. What is the equivalent resistance in the circuit?
a 36Ω b 22.5Ω
c 12Ω d 9Ω

21. In the circuit–
i. the current of R_1 is double of R_2
ii. the potential difference of R_2 and R_4 is equal
iii. the power of R_1 is more compared to R_3
Which one is correct?
a i b ii
c ii and iii d i and iii

22. The wave length of which of the following is larger than that of the visible light?
a Gamma Ray b X-ray
c Radio Wave d Ultraviolet

23. The kinetic energy of a moving object will be 4 times if–
i. velocity is double
ii. both velocity and mass are double
iii. velocity is double and mass is half
Which one is correct?
a i b ii
c i and ii d ii and iii

24. In case of a freely falling object from rest–
a velocity is proportional to the square of the travelled distance
b the travelled distance is proportional to the square root of velocity
c the travelled distance is proportional to the square root of time
d velocity is proportional to the time

25 Which of the following has more specific resistance?
a Silver b Copper
c Gold d Graphite

Ans.																										
	1	b	2	a	3	d	4	c	5	a	6	b	7	c	8	a	9	b	10	c	11	a	12	b	13	d
	14	a	15	d	16	b	17	c	18	b	19	c	20	c	21	c	22	c	23	a	24	d	25	d		

17. Jashore Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ For a rectangular box, the outer reading of length 60 cm, breadth 40 cm and height 10 cm. For determine the thickness of the box. the vernier scale reading are given below:

Main scale reading	Vernier scale division	Vernier constant
2 cm	8	0.1 mm

a. What is pitch of screw? 1
b. Explain the necessity of unit for determine the value of physical quantity. 2
c. Determine the percentage of relatvie error of the surface area when 5% relative error presence for determine box's length and breath. 3
d. How much water necessary to fulfil the box? Analyze mathematically. [water density is 1000 kg/m^3] 4

2. ▶ A blind man standing in the footpath for crossing the road. For catching the blind man Shafiq who stand 80 meter away, start running with acceleration 2 ms^{-2} from a tea shop when he saw a car comes with uniform velocity 36 kmh^{-1}. At that time blind man moves extra 1 meter from Shafiq.

a. What is scaler quantity? 1
b. Why time is equal in case of throwing objects upward and falling? Explain. 2
c. Determine how much time require to move 10 meter of the car. 3
d. If the car is 100 meter away from the blind man, than whether it is possible in case of Shafiq to reach the blind man before reach the car? Analyze mathematically. 4

3. ▶ The weight of trolly with a bag of rice is 196N. Pull the trolly, 50 meter from the initial point and spending 10 second where the friction force of the surface is 2N. Then the applied force is withdrawn.

a. What is momentum? 1
b. Why run forward in case of jump from a moving riksha? Expalin. 2
c. Determine the applied force on the trolly. 3
d. Whether it is possible to travel 600m distance after withdrown the applied force? Analyze mathematically. 4

4. ▶ A crane of power 5 kw, lift an object of mass 1500 kg from a height 15 meter in 4 minutes. Another a crane of power 2 kw, lift an object of mass 1000 kg from a height, 20 meter in 5 minutes.

[Velocity of light 3×10^8 ms^{-1} and g = 9.81 ms^{-2}]

a. What is kinetic energy? 1
b. Why the unit of work and energy is same? Explain. 2
c. Determine how much energy in joul are found when convert the mass of the first object into energy. 3
d. Which one is move benefited in case of crane? Analyze mathematically with the help of efficiency. 4

5. ▶ 20000 N force require to produce oil from an il bean. Ratio of the radius of the smaller and greater piston of a hydraulic press is 1 : 10. 100 N force applied on the small piston and the outcome of this force displacement of the small piston is 30 cm and greater piston is 3 cm.

a. What is strain? 1
b. Why it is possible to immersed of body in the river when this body floating in the ocean? Explain. 2
c. Determine the equal work done is happen in greater and smaller piston in the mentioned stem. 3
d. How much time increase the radius of the greater piston for produce the necessary force which is requir to oil production? Analyze mathematically. 4

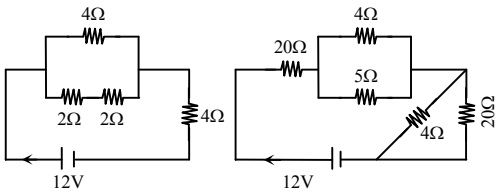
6. ▶ The height of the well is 100 meter. One forth is fulfiled with water in case of height. At 0°C temperature the velocity of the sound is 330 ms^{-1}. At the upper surface, produce a sound and after 0.44 second then the sound is reflected back. The radius of the well is 2 meter.

a. What is echo? 1
b. What do you mean by intensity of sound is 10 wm^{-2}? Explain. 2
c. Determine the temperature of the location of the well. 3
d. If the temperature is 30°C than maximum how much water require to fulfil the well where easily an echo will be heard? Analyze mathematically. 4

7. ▶ Radius of the curvature of the concave mirror is 50 cm. A mobile phone of length 15 cm place 30 cm away from the pole of a mirror.

a. What is principal focus? 1
b. Why convex mirror is called conversing mirror? Explain. 2
c. Determine the image length of the mobile that mentioned in the stem. 3
d. There will be no change in the lenght of the mobile, image, where it will be placed? Analyze with ray diagram. 4

8. ▶



a. What is resistance? 1
b. Explain why the resistance of a thickwire is less than thinwire. 2
c. Determine the equivalent resistance of the first circuit. 3
d. Compare the electric power of the two circuits. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. Who predicted the eclipse of the sun?
a Thales b Democritus
c Aristotle d Aristarchus

2. Who invented Calculus which is a new branch in Mathematics?
a Scientist Newton and Copernicus
b Scientist Newton and Galileo
c Scientist Newton and Leibnitz
d Scientist Newton and Rutherford

3. Which one of the following is not a fundamental quantity?
a Mass
b Heat
c Electric current
d Quantity of substance

4. Which of the following are vector quantities?
a Speed, work and velocity
b Electric potential, displacement and acceleration
c Speed, displacement and velocity
d Momentumn, displacement and weight

5. Which is the dimension of force?
a MLT^{-2} b MLT^{-1}
c $ML^{-2}T^{2}$ d $M^{-1}LT^{-2}$

6. The distance travelled in a given time by a freely falling body from rest will be–
a proportional to the time
b inverselyh proportional to that time
c inversely proportional to the square of that time
d proportional to the square of that time

7. A train started to move with a uniform acceleration of $20ms^{-2}$ from rest position. What will be the velocity while crossing a post at a distance of 250m?
a $25\ ms^{-1}$ b $100\ ms^{-2}$
c $100\ ms^{-1}$ d $10000\ m^2s^{-2}$

8. Which is the unit of momentum?
a kgm b $kgms^{-1}$
c kgm^2s^{-1} d $kgms^{-2}$

9. For which frictional force, fish can swim in water?
a Static friction b Sliding friction
c Rolling friction d Fluid friction

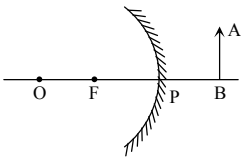
10. A force of 200 N is applied on a stationary body of mass 10 kg for 20s. What is the velocity after 20s?
a 20 m/s b 200 m/s
c 400 m/s d $400\ m/s^2$

11. When a mango falls from the tree–
i. increase the kinetic energy
ii. decrease the potential energy
iii. total energy remains unchanged
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

12. What type of energy is stored when a body is stretched?
a Potential energy b Kinetic energy
c Heat energy d Chemical energy

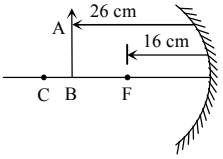
13. Which of the following are renewable energy?
a Coal, geothermal energy and sea wave
b Natural gas, tides and air flow
c Water flow, heat from sea and sunlight
d Sunlight, Hydrogen fuel and Uranium

14.



What would be the image of AB on the mirror P–
i. smaller and upright
ii. magnified and upright
iii. virtual and upright
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Answer the questions no. 15 and 16 from the following stimulus:



15. What is the radius of curvature of the mirror?
a 8 cm b 16 cm
c 26 cm d 32 cm

16. If AB is moved at 6 cm back from the mirror then image is–
i. virtual and erect
ii. real and inverted
iii. formed at the center of curvature and it is equal to the object
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

17. What is the name of the apparatus used to measure the atmospheric pressure?
a Thermometer b Barometer
c Manometer d Seismometer

18. To increase area of a body–
i. pressure decreases
ii. force increases
iii. density increases
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

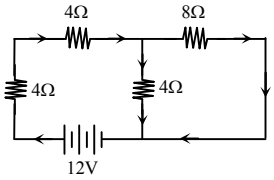
19. What type of wave is sound?
a Transverse wave
b Electromagnetic wave
c Longitudinal wave
d Radio wave

20. The velocity of sound in air is highest in which season?
a Winter b Summer
c Rainy season d Spring

21. Where convex mirros are used?
a Cars b Torch light
c Solar oven d Radar

22. Image in a plane mirror is–
i. real ii. straight
iii. equal to the size of the object
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Answer the questions no. 23 and 24 from the following stimulus:



23. What is the equivalent resistance of the circuit?
a 8.375Ω b 10.67Ω
c 17.67Ω d 20Ω

24. If the resistance having 8Ω is removed from the circuit–
i. current flow through the circuit increases
ii. equivalent resistance of the circuit increases
iii. the potential difference will be same across each resistor
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

25 You feel your weight due to which force of the following?
a Gravitational force
b Electromagnetic force
c Weak force
d Strong nuclear force

Ans.																									
	1	a	2	c	3	b	4	d	5	a	6	d	7	c	8	b	9	d	10	c	11	d	12	a	13	c
	14	b	15	d	16	b	17	b	18	a	19	c	20	b	21	a	22	c	23	b	24	c	25	a		

18. Barishal Board-2022

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ An insoluble cubic object is put into 750 g mass of water. Then the object is measured by a slide calipers whose readings are 12.6 cm in the main scale, 4 in vernier scale. Vernier constant of the scale is 0.01 cm. (density of water is 1000 kgm^{-3})

a. What is quantity? 1
b. What is the limitation of metre scale in case of small and accurate measurement? Explain. 2
c. Measure the lenght of the cubic object. 3
d. How much the cubic object will sink in the water? Mathematically explain. 4

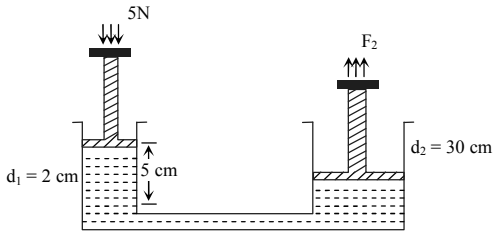
2. ▶ A and B two objects of same volume are dropped in the air from the height of 39.6 m. Object A lands on the ground after 3s. Object B lands on the ground after that. The mass of A and B are 100 g and 50 g respectively.

a. What is transitional motion? 1
b. Explain the causes why the distance and displacement between your school and your house are different? 2
c. Determine how much time object A will take to land on the ground if there is no air friction. 3
d. Explain mathematically why object B delayed in landing. 4

3. ▶ An empty truck of 4000 kg mass hits a brick laden stationary truck of 13000 kg mass at the velocity of 20 ms^{-1}. The empty truck is damaged more in the colision.

a. What is inertia? 1
b. Why does the velocity of a freely falling object increase gradually? 2
c. With what energy does the empty truck hit the other truck in rest? 3
d. Mathematically explain why the empty truck is damaged more. 4

4. ▶

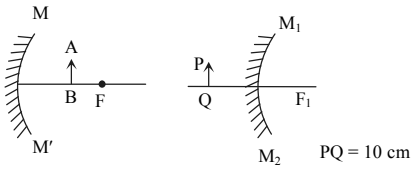


a. Write down Hooke's Law. 1
b. Why does a boat float higher after its passengers get down? Explain. 2
c. Determine the displacement of the big piston in the stem. 3
d. If 5N, 12N and 30N force is applied to the small piston respectively, what will be the force aquired in the big piston? Explain graphically. 4

5. ▶ A boy standing 18m away from a hill shouts out loud at wavelength 22 cm. He tells his friend, who is standing 2 m in front of him, that he has heard the echo. The boy asks him if he has heared it too. The velocity of sound is 344 ms^{-1}.

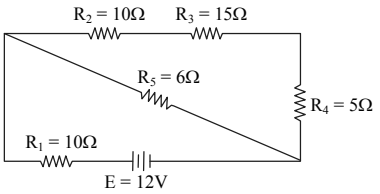
a. What is timbre? 1
b. Why are the wavelengths different when two friends talk to each other? Explain. 2
c. Determine the periodic time of the sound produced by the boy. 3
d. What will be the correct answer to the question the boy has asked to his friend? Explain mathematically. 4

6. ▶



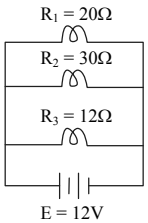
a. What is ultraviolet ray? 1
b. What colour will be a yellow flower if it is seen through a red sunglass? Explain. 2
c. Determine the magnification of the object PQ by considering M_1M_2 as a plane mirror. 3
d. Will the images formed on both the mirrors be the same? Explain with a diagram. 4

7. ▶



a. What is electrical power? 1
b. Explain the reason why several cells are connected in a series in TV remote. 2
c. Determine the equivalent resistance of the circuit. 3
d. Cna a 10W bulb be used in place of the resistances without changing the main current of the circuit? Explain mathematically. 4

8. ▶



a. What is electromotive force? 1
b. Why copper is better as a conductor than iron? Explain. 2
c. Determine the current of resistance R_1. 3
d. Which bulb has more thermal waste? Explain mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

*[N.B.— Answer any **fifteen** questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the **"Answer Sheet"** for Multiple Choice Questions Examination.]*

Candidates are asked not to leave any mark or spot on the question paper.

1. Which one is the unit of intensity of sound?
a Wm^{-1} b Wm^{-2}
c Jm^{-2} d Nm^{-2}

2. The length of one smallest division of main scale of a slide calipers is 1 mm. Number of division of vernier scale is 10. What is the vernier constant?
a 0.01 cm b 0.001 mm
c 0.001 m d 0.1 m

3. If an object is thrown vertically upward with a velocity 100 ms^{-1}, at what maximum height will it reach?
a 510 m b 410 m
c 210 m d 110 m

4. If temperature is increased, in a conductor–
a electric current increases
b resistance increases
c electric current remains unchanged
d resistance decreases

5.

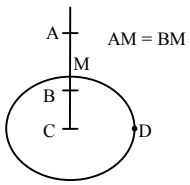
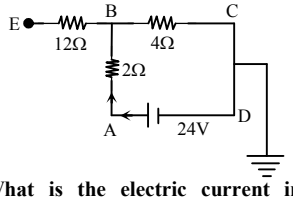


Fig: The earth

If acceleration due to gravity at M, A, B, D are g, g_1, g_2, g_3 then–
i. $g > g_1$ ii. $g_1 = g_2$
iii. $g_3 < g$
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Answer the questions no. 6 and 7 in the light of following circuit:



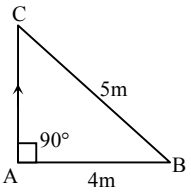
6. What is the electric current in the circuit?
a 4 A b 1.33 A
c 6 A d 18 A

7. What is the potential at point E?
a 16 V b 24 V
c 0 V d 18 V

8. Which one is fundamental unit?
a Joule b Newton
c Candela d Pascal

9. Who predicted the existence of an anti particle by the combination of quantum theory and the theory of relativity?
a Maxwell b Dirac
c Einstein d Plank

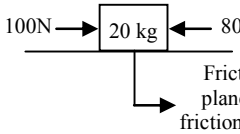
10.



A person starts his journey from A and reaches at C through B in 5 seconds. His–
i. displacement 3m
ii. speed 1.8 ms^{-1}
iii. velocity 5 ms^{-1}
Which one is correct in the light of above information?
a i and ii b i and iii
c ii and iii d i, ii and iii

11. Which pair is scalar quantity?
a Work, Power
b Velocity, Momentum
c Displacement, Force
d Acceleration, Buoyancy

12.

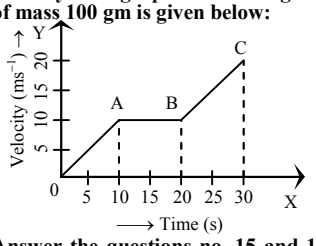


What will be the magnitude and direction of effective acceleration in the object?
a 5 ms^{-2} towards right
b 4 ms^{-2} towards left
c 1 ms^{-2} towards right
d 9 ms^{-2} towards right

13. In case of efficiency–
i. efficiency = $\frac{\text{Energy wasted}}{\text{Total energy given}}$
ii. efficiency = $\frac{\text{Output effective energy}}{\text{Total energy given}}$
iii. efficiency = $\frac{\text{Energy given} - \text{Energy wasted}}{\text{Total energy given}}$
Which one is correct?
a i b i and ii
c ii and iii d i, ii and iii

14. Which one is non renewable energy?
a Geothermal b Hydroelectricity
c Solar energy d Nuclear energy

Velocity-time graph of a moving object of mass 100 gm is given below:



Answer the questions no. 15 and 16 in light of above figure:

15. What is the acceleration of the part OA?
a 10 ms^{-2} b 5 ms^{-2}
c 1 ms^{-2} d 0 ms^{-2}

16. In the graph–
i. the acceleration of the part AB is zero
ii. slopes of the parts OA and BC are same
iii. the change of kinetic energy in the part BC is 15 J
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

17. Which one is the dimension of stress?
a $ML^{-1}T^{-2}$ b ML^2T^{-2}
c ML^2T^{-3} d $ML^{-2}T^{-3}$

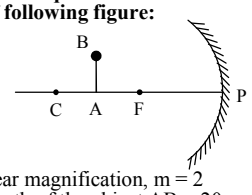
18. The volume of an object of mass 100 kg is 0.2 m^3. If the object is released in water, then it will–
a float with half immersed
b float with partly immersed
c float with completely immersed
d cmpletely sink placing at the bottom

19. Which one is the unit of Young's modulus?
a Nm^{-2} b Nm^{-1}
c Nm^{-3} d Nm^2

20. The height of a man is 168 cm. What is the required minimum length of a mirror to see a full-length image?
a 84 cm b 112 cm
c 168 cm d 336 cm

21. What will be the image if an object is placed between the principal focus and pole of a concave mirror?
a Real and inverted
b Virtual and erect
c Virtual and diminished
d Real and magnified

Answer the questions no. 22 and 23 in the light of following figure:



linear magnification, m = 2
Length of the object AB = 20 cm

22. What will be the size of the image of the object AB?
a Diminished
b Magnified
c Equal size of the object
d Extremely magnified

23. What will be the length of the image of the object AB?
a 10 cm b 20 cm
c 30 cm d 40 cm

24. Velocity of sound (v) in air is–
i. $V \propto \sqrt{T}$ [Absolute temperature, T]
ii. $V \propto \frac{1}{\rho}$ [Density of air, P]
iii. $V \propto P$ [Air pressure, P]
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

25 Which relation is correct?
a $F_s = -K_x$ b $\frac{1}{u}+\frac{1}{f}=\frac{1}{v}$
c $T = 2\pi\sqrt{\frac{g}{l}}$ d $f = v\lambda$

Ans.																										
	1	b	2	a	3	a	4	b	5	b	6	a	7	a	8	c	9	b	10	a	11	a	12	c	13	c
	14	d	15	c	16	d	17	a	18	a	19	a	20	a	21	b	22	b	23	d	24	a	25	a		

19. Dhaka Board-2021

Physics Subject Code | 1 | 3 | 6 |

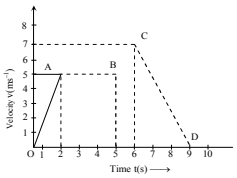
Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Answer any five questions.]

1. ▶ Length of an cubic object measured by a slide calipers is 8.876 cm. In the slide calipers, the length of smallest division of main scale is 1 mm and vernier constant is 0.002 cm.

a. What is the least count of a screwgauge? 1
b. Explain the formula of measuring vernier constant by slide calipes. 2
c. Find how many divisions of vernier scale is equal to what number of divisions of main scale in this slide calipers. 3
d. Why the relative error of measured length is less than that of measured area by the slide calipers. Give mathematical analysis on behalf of your answer. 4

2. ▶



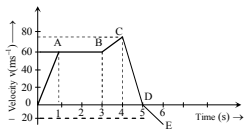
a. Define translational motion. 1
b. If we release some stone and cotton of same size from same place and time which one will fall first? Explain. 2
c. Find the distance traveled by the object in first 5s. 3
d. Draw a acceleration Vs time graph from the above graph. Explain each part of the graph. 4

3. ▶ For a car, velocity and time information are given below :

Time (s)	0	5	10	15	20	25	30	35	40
Velocity (ms^{-1})	0	5	10	15	20	20	20	15	10

a. State the second law of a falling body. 1
b. "Every simple harmonic motion is periodic motion, but every periodic motion is not simple harmonic motion" — Explain. 2
c. Draw a velocity Vs time graph. 3
d. Calculate the distance travelled by the car. How times the car change its direction in its complete travelling path — Explain it according to the stem. 4

4. ▶ **Scenario-1:**



Velocity time graph for a car of mass 400 kg.

Scenario-2: An object thrown directly upward with a velocity 49 ms^{-1}.

a. State the law of conservation of energy. 1
b. Is it possible to have the efficiency of a machine more than 100%? Explain. 2
c. At which height object will the kinetic energy of the one-fourth of the potential energy? Determine. 3
d. Analyse the work done by the car at different portions of the graph. 4

5. ▶ Samim collected a spring to throw an object of mass 10kg at a height 20m. He compresses the spring 8cm by doing 800J work. But the spring does not able to throw the object at that height. Samim compresses the spring more so that he can throw the object at that height.

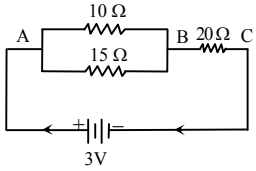
a. Define mechanical energy. 1
b. "Not only energy is obtained from energy, energy can also be obtained from mass." — Explain. 2
c. If the work done by the object is same as the spring, then how much distance the object will go along the land. [Force on the object is 20N] 3
d. By how much compression of the spring Samim will be able to throw the object at the desire height? Analyse mathematically. 4

6. ▶ Sajib and Rakib collect two mirrors A and B accordingly of focal length 10cm to make a telescope. They have done some experiments and collect some information which shown below in the table.

Mirror A	Distance of object from mirror is 20 cm.	Image produced at the same place equal size but inverted
Mirror B	Distance of object from mirror is 20 cm.	Image produced behind the mirror erect but small in size.

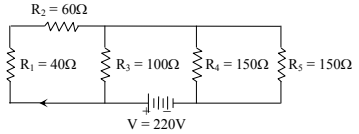
a. Write down the first law of reflection. 1
b. Why, in blue light, green leaves of trees turn black but white paper turns blue? Explain. 2
c. Find the distance of image when an object placed at a distance 15 cm. from the mirror A. 3
d. From the above table which mirror is suitable to make a telescope? Explain your opinion by drawing figure. 4

7. ▶



a. Define Rheostat. 1
b. Why resistance decreases in semi-conductor with increasing temperature? Explain. 2
c. Calculate the potential difference between the points B and C. 3
d. How can we get 10Ω equivalent resistance by rearranging the above resistances? Give mathematical explanation and draw a circuit. 4

8. ▶



a. Write down the Ohm's law. 1
b. Explain the correct connections of switches in an electric circuit. 2
c. Calculate the current flowing in the circuit. 3
d. Draw a circuit for a room in a house by the equipments associated with the above resistances in stem and explain it's convenience. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N.B.— Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" For Multiple Choice Questions Examination.]

Candidates are asked not to leave any mark or spot on the question paper.

1. In which way $\frac{1}{2}mv^2$ can be written?

a $mu^2 + W$

b $\frac{1}{2}mu^2 + 2W$

c $\frac{1}{2}mu^2 + W$

d $\frac{1}{2}mu^2 + \frac{1}{2}W$

2. Main scale reading is 12mm, Vernier concides 7 and Vernier constant is 0.10mm. What will be result?

a 1.27mm b 12.7cm

c 1.27cm d 1.29 mm

3. In screw gauge, the number of circular divisions is 'a', the least constant is 'b' and the pitch is 'c'. Which one is correct?

a abc = 1 b c = ab

c a = bc d b = ac

Answer the questions no. 4 and 5 in the light of figure :

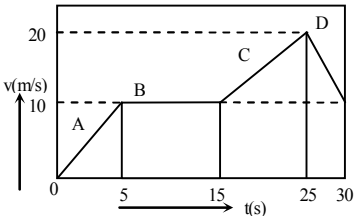


Fig: Changing the velocities with respect to time of a body

4. What is the rate of change of velocity in 5 sec?

a $0.5 m/s^2$ b $2 m/s^2$

c $5 m/s^2$ d $10 m/s^2$

5. In the figure —

i. value of acceleration at A and C are unequal

ii. covered distance in first 15 sec is 125m

iii. final velocity of the body is 10m/s

Which one is correct?

a i and ii b ii and iii

c ii and iii d i, ii and iii

6. An object moves 10m in straight path and come back 4m along the same path. What is the difference between distance and displacement?

a 4m b 6m

c 8m d 14m

7. The velocity of a body moving with uniform acceleration increases from $4ms^{-1}$ to $8ms^{-1}$ in 2 sec. What will be the velocity of the body after 4 sec?

a $12ms^{-1}$ b $16ms^{-1}$

c $20ms^{-1}$ d $24ms^{-1}$

8. If velocity doesn't change (u = v), then the equation of displacement —

i. $s = ut + \frac{1}{2}at^2$ ii. $s = \left(\frac{u+v}{2}\right)t$

iii. s = vt

Which one is correct?

a i and ii b ii and iii

c i and iii d i, ii and iii

9. If one ampere electric current flows for one second then what is called the amount of charge?

a One ampere b One volt

c One ohm d One coulomb

10. If 10C charge flows in 5 sec, what will be electric current?

a 0.5 A b 2A

c 5A d 10A

In the light of stem answer the questions no. 11 and 12:

After cutting a hollow glass sphere of diameter of 40cm a spherical mirror is made by coating on outside with silver. A body is placed at a distance of 15cm from the centre of reflecting surface.

11. What is the focal length of that spherical mirror?

a 40cm b 20cm

c 15cm d 10cm

12. The image formed on the mirror —

i. real ii. inverted

iii. at 30cm distance

Which one is correct?

a i and ii b ii and iii

c i and iii d i, ii and iii

13. If 10% energy is wasted in every step, what is the efficiency in 2 steps?

a 90% b 81%

c 80% d 20%

14. What is resistance of dry skin of human beings?

a $3k\Omega - 20k\Omega$ b $3k\Omega - 30k\Omega$

c $3k\Omega - 40k\Omega$ d $3k\Omega - 50k\Omega$

15. Which one is the scalar quantity?

a Velocity b Speed

c Displacement d Acceleration

16. Which of the following substance has more conductivity?

a Air b Diamond

c Graphite d Gold

17. From how many square kilometer area about 5000 MW heat energy can be found from the sun as light?

a 5 b 500

c 1000 d 5000

18. Which one of the folloiwng is the unit of energy?

a $Kgms^{-1}$ b Kgm^2s

c Kgm^2s^{-2} d $Jkg^{-1}K^{-1}$

19. In thermocouple applying heat at the junction of two different metals which energy can be produced directly?

a Mechanical energy

b Light energy

c Electrical energy

d Geothermal energy

20. At what angle two normal mirrors should be kept due to left and right unchanged image?

a 30° b 45°

c 60° d 90°

21. In which color the sensitivity of eyes is maximum?

a Blue b Violet

c Green d Red

22. If the third line of Vernier scale concides with the thirteenth line of the main scale, what will be the Vernier reading?

a 3 b 10

c 13 d 16

23. What is indicated by the symbol (—| |—)?

a Battery

b Cell

c Capacitor

d Disconnected wire

24. In case of a spherical mirror the linear magnification is 0.5 and the length of the object is 2m. What will be the length of the image?

a 0.5m b 1m

c 2m d 4m

25. If 100kg mass is lifted at height 10m in 15 sec using a motor of 1kW then how much energy will be lost?

a 9800J b 5200J

c 1500J d 1000J

Ans.																											
	1	c	2	c	3	b	4	b	5	d	6	c	7	a	8	b	9	d	10	b	11	b	12	d	13	b	
	14	d	15	b	16	d	17	a	18	c	19	c	20	d	21	c	22	a	23	c	24	b	25	b			

20. Mymensingh Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ A student measured his geometry box with a scale and told his teacher that its length was 20.63cm. The teacher said, this measurement may not be accurate. For accurate measurement, the teacher asked him to use a vernier scale with a vernier constant of 0.002cm.

a. What is the least count of a screw guage? 1
b. What is the necessity of accurate measurement? 2
c. Determine what part of the vernier scale of the stem is equal to what part of the main scale. 3
d. Whether the student's length measurements were consistent — Give logical explanation. 4

2. ▶ A travelling motorcycle's velocity VS time table is as follows.

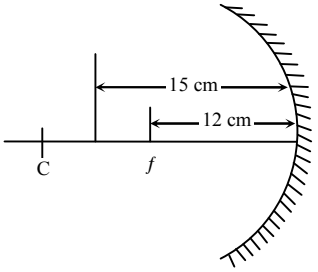
Velocity (ms^{-1})	2	4	6	6	3
Time (s)	0	10	20	30	40

a. Define periodic motion. 1
b. For an object, if the speed will change, the velocity may not be changed — Explain. 2
c. Determine the distance travelled by the motorcycle in 15 seconds. 3
d. Analyze the acceleration by drawing a graph according the information of the above stem. 4

3. ▶ A cricket ball of weight 200gm was thrown upward at a velocity of $40ms^{-1}$. Just at this moment, another object of weight 2 kg was dropped from a height of 150m.

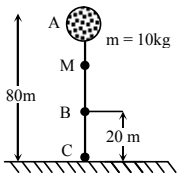
a. Define decelleration. 1
b. Vibrational motion is a kind of periodic motion — Explain. 2
c. Determine the movement time of the cricket ball. 3
d. At which height from the ground surface will the two objects meet? Analyze mathematically. 4

4. ▶ An object of 5cm length is placed in front of a mirror of 0.5 magnification which is shown in the figure below.



a. Define image. 1
b. Why does the leaf of the mango tree look green in green light but ripe mango looks black? 2
c. Determine the length of image of the object at the stem. 3
d. What will be the position and nature of the image for the object of the stem? Analyze by drawing ray diagram. 4

5. ▶



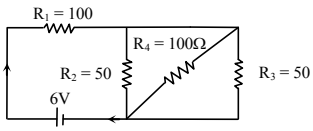
The kinetic energy of the object at point M is 180 Joule.

a. Define efficiency. 1
b. Why is biomass called renewable energy? 2
c. Determine the velocity of the object in position M. 3
d. Mathematically explain the change in the potential energy and kinetic energy of the object at point B and C, when it is dropped freely from position A. 4

6. ▶ A fan of 75 Watt, a bulb of 60 Watt, a refregerator of 500W and a fuse of 5 Amp were connected as equipments for electric connection in a room. The room will be connected to a 220Volt power line.

a. Derive Ohm's law. 1
b. If temperature increases why the conductivity of the conductor decreases? 2
c. Calculate the amount of electricity flowing through the fan? 3
d. Draw a circuit diagram by using the stem's equipments for a room and explain its usefulness. 4

7. ▶



a. Define semiconductor. 1
b. Write down the difference between voltage difference and electromotive force. 2
c. If the radius of the wire with resistance R1 is 0.1mm and specific resistance is $1.7\times10^{-8}\Omega$-m then calculate the length of the wire. 3
d. Will the current flowing through each resistance are same or different? Explain mathematically. 4

8. ▶ Shamim collected a spring of mass 10kg to through an object to a height 20m. He compressed the spring 8cm by doing 800J work. But the spring was not able to throw the object at that height. Shamim compressed the spring more, so that he can throw the object at that desired height.

a. Write the conservation law of energy. 1
b. Explain the relation between momentum and kinetic energy. 2
c. If the work done by the object is same as the spring then how much distance will the object go along the land? [Force applied to the object is 20N] 3
d. By how much compression on the spring Shamim will be able to throw the object to the desired height? Analyze mathematically. 4

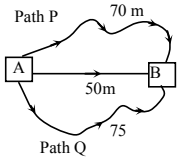
Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

1. Without considering the circular motion of the wheel of a car, straight advancement of the car is called —
a translational motion
b circular motion
c periodic motion
d simple oscillatory motion

2. When an object is raised from the ground and kept on the table, then —
a Work done > potential energy
b Work done = potential energy
c Work done < potential energy
d Work done ≠ mechanical energy

3.



In above figure —
i. the distance from A to B along the path P is 70 m
ii. the displacement from A to B along the path Q is 50 m
iii. the difference of the displacement from A to B along both the paths is zero
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

4. Which one do sun or stars use to produce their energy?
a Nuclear fusion b Nuclear fission
c Geothermal d Light

5. If temperature and material of a conductor are kept constant, then the relation between electric current and potential difference will be —
a proportional
b inversely proportional
c proportional to the square
d inversely proportional to the square

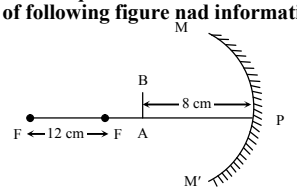
Answer to the questions no. 6 and 7 in the light of following information :
In the determination of the area of cross section of a wire, linear scale reading of the screwgauge is found 2 mm, circular scale reading is 0.4 mm and total number of divisions of the circular scale is 100. [Here the pitch of the instrumenet is 1 mm]

6. Which mark of the circular scale coincides with the mark of the linear scale?
a 2 b 4
c 40 d 100

7. Area of the cross section of the wire is —
a 3.77 mm^2 b 4.524 mm^2
c 9.048 mm^2 d 18.096 mm^2

8. At what percentage is light refelcted from a piece of glass?
a 4% to 5% b 40% to 50%
c 80% to 90% d 95% to 96%

Answer the questions no. 9 and 10 in the light of following figure nad information :



9. What is the magnification of the image of the object AB?
a 0.33 b 1.5 c 3 d 24

10. In the figure —
i. image of the object AB will be virutal and erect
ii. if the length of the object AB is 2 cm, then the length of the image will be 6 cm.
iii. if the object AB is moved 16 cm towards left, then the magnification will be 1
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

11. At what angle is a red rose placed in front of a mirror to look brightest?
a 30° b 45° c 60° d 75°

12. At what angle are two mirros kept to make a mirror so that lateral inversion of the images is not appeared?
a 30° b 45° c 60° d 90°

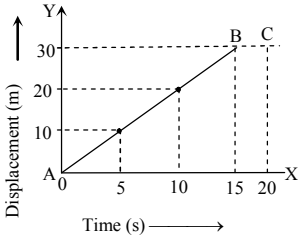
13. Which one is the most general form of energy?
a Mechanical energy
b Sound energy
c Electrical energy
d Heat energy

14. In case of the determination of the length of a rod with the help of slide callipers if main scale reading is M. Vernier constant is VC and Vernier super imposition is V, then which one is the formula to determine the length of the rod (L)?
a $L = M - V \times CV$
b $L = M + V \times VC$
c $L = M - V + VC$
d $L = M + V + VC$

15. Laws of falling bodies are given by —
a Galileo b Newton
c Einstein d Copernicus

16. Which one of the following is responsible for the rise of height of sea level?
a alcohol b Biomass
c Carbon dioxide d Methane

Answer the questions no. 17 and 18 in the light of following figure and information :



In figure velocity time graph of a car is shown.

17. What was the nature of the motion of the car in the part AB of the figure?
a Uiform acceleration
b Uniform velocity
c Uniform retardation
d Non-uniform acceleration

18. In the graph of —
i. the part BC, velocity of the car is 0 ms^{-1}
ii. the part AB, slope is 2 ms^{-1}
iii. first 15 sec, acceleration of the car is zero
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

19. What is the unit of conductivity?
a $\Omega\ m^{-1}$ b Ω^{-1}
c Ω m d $(\Omega\ m)^{-1}$

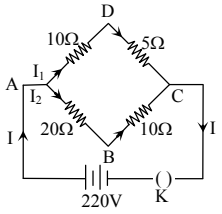
20. Which one of the following is the wave length of visible light?
a 300ηm–700ηm
b 400μm–700ηm
c 300μm–700μm
d 700μm–400μm

21. Which one of the following is the source of renewable energy?
a Diesel b Methane
c Biogas d Coal

22. Which one of the following is the unit of work?
a $kgms^{-1}$ b $kgms^{-2}$
c kgm^2s^{-2} d $kgms^{-3}$

23. If the velocity of a motor cycle decreases uniformly from 30 ms^{-1} and after 8 seconds becomes 14 ms^{-1}, then what will be the retardation of the vehicle?
a $-4\ ms^{-2}$ b $-2\ ms^{-2}$
c $2\ ms^{-2}$ d $4\ ms^{-2}$

Answer the questions no. 24 and 25 in the light of the following figure and information :



24. What is the equivalent resistance of the circuit of the stem?
a 45 Ω b 30 Ω
c 15 Ω d 10 Ω

25. In the circuit of the stem —
i. electric current is 22A
ii. total power of the resistors is 4.84 KW
iii. potential drop along the paths ABC and ADC are equal
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Ans.																										
	1	a	2	b	3	d	4	a	5	a	6	c	7	b	8	a	9	c	10	d	11	d	12	d	13	a
	14	b	15	a	16	c	17	a	18	d	19	d	20	b	21	c	22	c	23	c	24	d	25	d		

21. Rajshahi Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

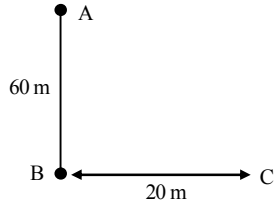
Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The distance of a school from Fahim's house is 1.8 km. While going to school he goes from rest with uniform acceleration of 0.5 ms^{-2} in the first 20 sec, then with uniform velocity in the next 2.5 min and becomes static at the last 40 sec with uniform deacceleration by bicycle.

a. What is Vernier constant? 1
b. What is meant by least count 0.02 mm of a screw gauge? 2
c. What distance is crossed by Fahim in the first 1 min? 3
d. Will Fahim reach the school within that times mentioned in the stem? Give your opinion with mathematical analysis. 4

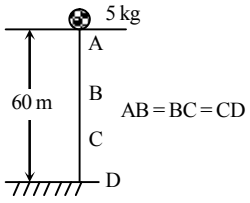
2. ▶



A tennis ball from rest is released from point 'A' to point 'B. Seeing that, a boy ran from 'C' to 'B' with the velocity at 5 ms^{-1} to catch the ball. In that place g = 9.8 ms^{-2} and wind is not a factor.'

a. What is relative error? 1
b. Why the rate at change of displacement is not same for a freely falling body? Explain it. 2
c. determine the velocity of the tennis ball before touching the ground. 3
d. Can the boy catch the ball standing at the point C? Analyze mathematically. 4

3. ▶

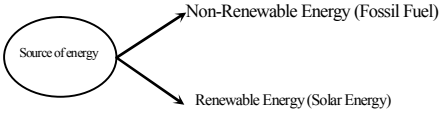


In the above figure a body of mass 5 kg falls freely from point A.

a. What is efficiency? 1
b. Why nuclear energy is called non-renewable energy? 2
c. how much height will the body remain after 3 sec from ground? 3
d. Will the total energy be equal at the points A, B and C? Give your opinion with mathematical analysis. 4

4. ▶ **Scenario-1:** If a body of mass 2 kg is thrown above with a velocity of 30m/s, it reaches at a certain height and its full kinetic energy is converted into potential energy.

Scenario-2:



a. What is called control rod? 1
b. Why work is negative? Explain. 2
c. At how much height the full kinetic energy of the body is converted into potential energy according to the scenario-1? 3
d. Express your opinion about negative impact of energy on the environment by the explanation of conservation of energy according to the scenario-2. 4

5. ▶ The focal distance of a concave mirror is 0.4m. An object is placed in front of it from the pole at half of the focal distance.

a. What is called focal distance? 1
b. Regular reflection and irregular reflection of light are not same — Explain. 2
c. Find out the distance of images from the mirror in the light of stem. 3
d. Analyse the position, size and nature of image of the object with the help of ray diagram of the stem. 4

6. ▶

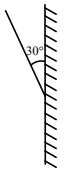


Figure : Mirror-1

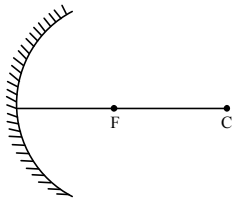
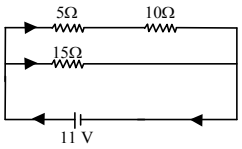


Figure: Mirror-2

a. What is image? 1
b. Why does green leaf of tree look black under blue light? 2
c. Determine the value of reflection angle of mirror-I. 3
d. Analyse the reason of observing the behind scenery of the car using mirror-2 of the stem with figure. 4

7. ▶



a. What is called rheostal? 1
b. Why electric current is changed with the change of resistance? 2
c. Determine the equivalent resistance of the circuit of the stem. 3
d. how resistances of the circuit are arranged so that the flow of current will be 1A? Analyse mathematically. 4

8. ▶ Two bulbs each of 100W is connected in series with a source of 220V to do work on the roof of a building.

a. What is conductivity? 1
b. Electromotive force is not force — Explain it. 2
c. Determine the flow of current from the stem. 3
d. Will the potential difference between the two ends of each bulb be 110V? Analyse mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

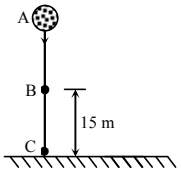
1. Where convex mirros are used?
a Solar Oven
b Torch Light
c View Mirror of a car
d Radar

2. Which one is the unit of Lumiinous Intensity?
a A b K
c J d cd

3. Acceleration is —
i. derived quantities
ii. scalar quantities
iii. vector quantities
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

4. What is the conductivity of Gold?
a $40.98 \times 10^6\ \Omega^{-1}m^{-1}$
b $59.52 \times 10^6\ \Omega^{-1}m^{-1}$
c $1.59 \times 10^{-8}\ \Omega m$
d $2.44 \times 10^{-8}\ \Omega m$

Answer the questions 5 and 6 according to the figure below:



A falling object of 50g is shown in the figure.

5. What is the potential energy of the object at point B?
a 740 J b 75 J
c 73.5 J d 7.35 J

6. In figure, the object's —
i. work done is positive
ii. potential energy at 'A' is equal to kinetic energy at 'B'
iii. total energy at 'B' is equal to kinetic energy at 'C'
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

7. Which type of image is formed in plane mirror?
a Real & inverted
b Real & erect
c Virtual & erect
d Virtual & inverted

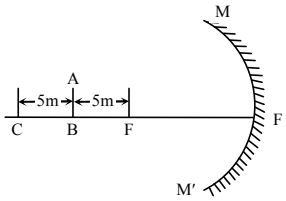
8. Which one is the unit of solid angle?
a Steredian b Candela
c Degree d Mole

9. What kind of change of spring constant will be done when a spring divided equaly into two parts?
a Half
b Decrease
c Increase
d Unchange

10. How much height an object travel when it was thrown at a velocity of g, vertically upword?
a 1m
b 4.9
c 9.8 m
d 96.04 m

11. One unit electricity = ?
a 100 J
b 1000 J
c 3.6×10^6 J
d 6.3×10^6 J

Answer the questions no. 12 & 13 according to the stem below:



12. What will be the nature of the image formed?
a Real and inverted
b Virtual and Inverted
c Real and erect
d Virtual and erect

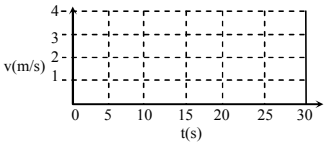
13. What will be the magnification of the object of AB?
a m<1 b m ≤ 1
c m = 1 d m > 1

14. Who is the inventor of Radium?
a Roentgen
b Max Planck
c Pierre Curie
d Al-Haium

15. 1 Picometer = How much centimeter?
a 10^{-18} b 10^{-16}
c 10^{-12} d 10^{-10}

16. At what velocity of a particle, momentum & Kinetic energy will be same?
a 4 m/s b 2 m/s
c $\frac{1}{2}$ m/s d $\frac{1}{4}$ m/s

17. Which one is the dimension of volume?
a L^3 b V
c L d m^3



Velocity-time graph of a particle is shown above. See the above figure and answer the questions no. 18 and 19.

18. How many distance travelled by the particle in first 15 s?
a 15 m b 30 m
c 45 m d 60 m

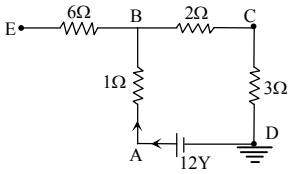
19. In which part of the above graph, the acceleratio is 0.4 m/s^2?
i. (0–5) sec ii. (10–15) sec
iii. (15–20) sec
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

20. What is the angle between focal plane and principal axis of a concave mirror?
a 90° b 180°
c 270° d 360°

21. Who discovered "Quantum theory"?"
a Newton b Einstein
c Satyendra Nath Basu
d Max Planck

22. In Uranium-235 —
i. has 92 protons ii. has 143 Neutrons
iii. has atomic no - 92
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Answer the questions no. 23 and 24 according to the figure below:



23. What is the flow of electricity through the circuit?
a 1A b 2A
c 3A d 4A

24. What is the potential at point 'C'?
a 2V b 4V
c 6V d 12V

25. The quantities having the same unit —
i. work & energy
ii. speed & velocity
iii. Vernier constant & Least count
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Ans.	1	c	2	d	3	b	4	a	5	d	6	b	7	c	8	a	9	c	10	b	11	c	12	a	13	d
	14	c	15	d	16	b	17	a	18	b	19	a	20	a	21	d	22	d	23	b	24	c	25	d		

22. Dinajpur Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The main scale reading of slide calipers and alignment of this vernier scale are found 9.9 cm and 12 respectively by measuring the length of a bar with the help of slide calipers. The length of the edge of another cube was found to be 5 mm. Vernier constant is 0.05 mm.

a. What is least count? 1

b. Is this type of scale used for accurate and microscopie measurement of the length? Explain it. 2

c. Determine the actual length of the object in the light of the stimulus. 3

d. If there is 5% relative error in measuring the length of a cube, what % relative error exists in measuring the area of one surface of the cube? Explain it mathematically. 4

2. ▶ Object A is moving with uniform acceleration of 5 ms^{-2} from a rest position and object B is moving with uniform velocity of 108 km/hr from 30 m behind.

a. What is speed? 1

b. What will the velocity be if the acceleration of the object is zero? Explain it. 2

c. How long after the start of the speed of the two cars will be equal? Determine it. 3

d. Explain mathematically whether the two objects can meet more than once during its movement. 4

3. ▶ A mango of 500 gm is hanging on a mango tree at a height of 10m. The mango fell down and got stuck some where after crossing 3m.

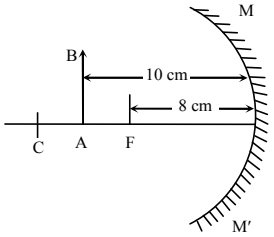
a. Define power. 1

b. Explain why biogas is called as a source of renewable energy. 2

c. Determine the potential energy of the mango while it is stuck. 3

d. Does mango obey the energy conservation law when it comes off and falls freely on the ground? Explain mathematically. 4

4. ▶ Observe the diagram and answer the following questions :



AB is the object.

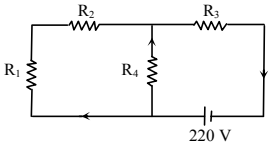
a. What is the reflection of light? 1

b. Why is the movie screen uneven and white? Explain. 2

c. Find out the value of the distance of the object. 3

d. If you place an object 6 cm and 18 cm away from the pole of the mirror, will the nature of the image be the same? Analyze with figure. 4

5. ▶ Observe the diagram and answer the following questions :



$R_1 = R_2 = 5\Omega$, $R_3 = 5\Omega$ and $R_4 = 15\Omega$

a. What is circuit? 1

b. Why is parallel circuit used in the home? Explain. 2

c. Determine the value of main electric current of this circuit. 3

d. If the circuit is run for 5 hrs per day how many units of current will be consumed in 30 days? Explain it mathematically. 4

6. ▶ A batsman hits a cricket ball and the ball bounces off the ground at a speed 90km/hr. A fielder ran 5sec to catch the falling ball.

a. What is acceleration? 1

b. What kind of speed is the speed of swinging swing? Explain it. 2

c. Determine the maximum height of the cricket ball from the ground. 3

d. Explain mathematically whether the fielder can catch the ball. 4

7. ▶ An electric motor can lift 1500 liters water from a depth of 20 m in 2 minutes. The efficiency of this electric motor is 60%.

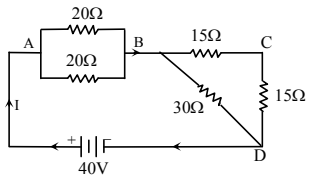
a. What is one joule? 1

b. Explain nuclear chain reaction with figure. 2

c. Determine the effective power of this electric motor. 3

d. Is it possible to lift water in 1.5 minutes if the efficiency of the motor is increased by 15%? Explain it mathematically. 4

8. ▶ Observe the below circuit and answer the following questions :



a. State Ohm's law? 1

b. Why are the resistances of two conductors of the same material length different? Explain it. 2

c. Find out the value of equivalent resistance of BD part of this circuit. 3

d. Whether the potential difference between the AB part and the CD part of this circuit will be same? Explain it with your own logic. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N.B.— Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions Examination.]

Candidates are asked not to leave any mark or spot on the question paper.

1. Using vernier scale minimum how much length can be measured? When number of vernier divisions is 10.
a 0.1 m b 0.01m
c 0.001m d 0.0001m

2. Which one of the following is not unit of spring constant?
a kgs^{-1} b Nm^{-1}
c Jm^{-2} d Kgs^{-2}

3. By which instrument length can be measured accurately?
a Meter scale
b Vernier scale
c Slide calipers
d Digital slide calipers

4. To complete on cycle of a circular path of radius 100 m a man takes 2 min. What will be the displacement after 1 min?
a 0 b 100 m
c 200 m d 314.16 m

5. If main scale reading M, vernier concides V and vernier constant VC then to measure wide which is correct?
a M × V × VC b M × V + VC
c M + V + VC d M + V × VC

6. Which one of the following is vector quantity?
a Speed b Force
c Heat d Work

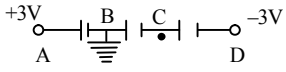
7. Which energy will be found when a stone fallen from a height?
a Heat energy
b Potential energy
c Kinetic energy
d Geothermal energy

8. Which one is correct?
a $v = st$ b $s = ut + \frac{1}{2}at$
c $v^2 = 2as$ d $t = \left(\frac{u+v}{2}\right)s$

9. Dimension of energy —
a MLT^{-1} b MLT^{-2}
c ML^2T^{-3} d ML^2T^{-2}

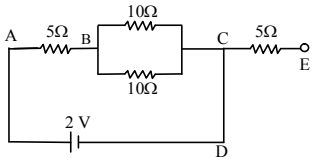
10. A free falling body travels 25 m in 5s. What distance will cover in 6th second?
a 36 m b 30 m
c 11 m d 5 m

11.



What is the potential at point B?
a – 1.5V b 0V
c 1.5V d 3V

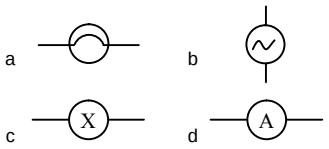
In the light of following stem answer questions no. 12 and 13.



12. What is the value of equivalent resistance of the circuit?
a 10 Ω b 15 Ω
c 25 Ω d 30 Ω

13. In that circuit —
i. electric current 0.2A
ii. electric power 0.4W
iii. consumed energy per minute 24J
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

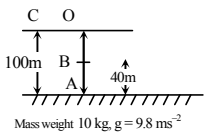
14. Which one is the symbol of AC source?



15. If length reduces to half what will be changed in resistance?
a $\frac{1}{4}$ times b $\frac{1}{2}$ times
c 2 times d 4 times

16. What is the relation among efficiency (η), work done (W), input energy (E) and Loss of energy (E*l*)?
a $\eta = \frac{E}{W} \times 100\%$
b $\eta = \frac{E_l - E}{E} \times 100\%$
c $\eta = \frac{E - El}{E} \times 100\%$
d $\eta = \frac{EW}{100} \times \%$

In the light of stem answer questions no. 17 and 18 :



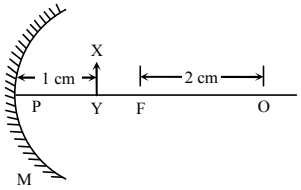
17. What will be work done to moves the body from A to B?
a 1960J b 3920J
c 5880J d 9800J

18. If the body falls freely from C —
i. total energy at A is 9800J
ii. velocity of the body at B is 34.29 ms^{-1}
iii. at point B, Kinetic energy and potential energy are equal
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

19. In chain reaction of Uranium how many neutrons will be emitted?
a 2 b 3
c 6 d 9

20. If a body is thrown vertically upward with a velocity of 19.6 ms^{-1} then what will be its maximum height?
a 2 m b 4.9 m
c 9.8 m d 19.6 m

21. Which ray emits from remote controller?
a Ultra violet b Microwave
c X-ray d Infrared



Answer the questions no. 22 and 23 in the light of above figure.

22. What is the distance of image from the object?
a 2 cm behind of the mirror
b 2 cm infront of the mirror
c 1 cm infront of the mirror
d 1 cm behind of the mirror

23. The image —
i. virtual and erect
ii. larger than object
iii. formed at focus
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

24. How is looked the yellow flower thorugh a blue glass?
a White b Blue
c Yellow d Black

25. At what angle two normal mirrors shouid be keeped due to left-right side unchanged of an image?
a 30° b 45°
c 60° d 90°

Board Exam Questions & Answers

Ans.																									
	1	d	2	a	3	d	4	c	5	d	6	b	7	c	8	c	9	d	10	c	11	b	12	a	13	d
	14	b	15	b	16	c	17	b	18	a	19	d	20	d	21	d	22	a	23	a	24	d	25	d		

23. Cumilla Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B.— The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions]

1. ▶ Ratul has got main scale reading 12 cm and Vernier coincides 6 by measuring the length of a square shaped book using a slide calipers. There may have error ±0.5 cm in measuring the length. The Vernier constant is 0.01 cm. To determine the area of the book 10% error acceptable.

a. What is Vernier constant? 1

b. What is meant by 1mm pitch of a screw gauge? 2

c. Find out the measured length of the book. 3

d. Will the obtained area measured by the mentioned instrument be acceptable or not? Give your opinion. 4

2. ▶ A bullet is fired with a velocity of 40 ms^{-1}. There is a wooden board attached with a earthen wall at a distance 50 m. The bullet has stopped after 0.01 sec entering into the board. The thickness of the board was 21 cm.

a. What is instantaneous speed? 1

b. The displacement may become zero but distance will not be zero of a moving object. Explain. 2

c. At what time the bullet will hit the wooden board? 3

d. Whether the wall will be damaged by the bullet or not? Show logic in favour of your answer? 4

3. ▶ The velocities of a car are noted 5 sec intervals are given below:

Time (ι) sec	0	5	10	15	20	25
Velocity (v) ms^{-1}	0	10	20	30	40	50

a. What is vector quantity? 1

b. Write down two differences between translational motion and rotational motion. 2

c. How much distance cover the car in 10 sec? 3

d. Drawing graph explain the nature of it. 4

4. ▶ Refat was sitting on a roof of a building of height 30 m. A ball was fallen suddenly from his hand. At that moment Sadiq threw a stone to the ball vertically upward with velocity of 10 ms^{-1}. The mass of stone was 0.2 gm.

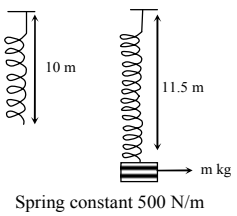
a. What is efficiency? 1

b. The velocity of a throwing body vertically upward is not uniform — Explain. 2

c. Find out the potential energy at maximum height. 3

d. Would any collision between stone and ball be occurred or not before touching the ground? Analyze it. 4

5. ▶



Spring constant 500 N/m

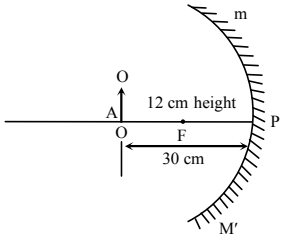
a. What is kinetic energy? 1

b. Why biomass is called source of renewable energy? 2

c. Calculate the value of 'm'. 3

d. If double mass is hanged in the spring then what will be changed in work done? Analyze mathematically. 4

6. ▶



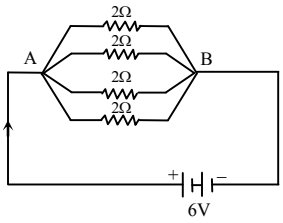
a. Define the reflection of light. 1

b. Why does reflected ray return to same path when incidence ray fall on a mirror perpendicularly? 2

c. Find out the linear magnification of the object. 3

d. When the object displaced 18 cm to the mirror then drawing ray diagram explain the nature, size and position of the image. 4

7. ▶



a. What is circuit? 1

b. How does system loss occur? Explain. 2

c. Find out the equivalent resistance of the circuit. 3

d. For which arrangement of given resistances electric current will be 1-2A? Analyze with diagram. 4

8. ▶ In a house two bulbs of 100W—220V and 200W—220V runs 5 hours daily. The rate of electric energy Tk. 6 per unit.

a. What is specific resistance? 1

b. Why does the resistance decrease when Silicon is heated? 2

c. What amount of electric energy will be consumed of that house in April? 3

d. Whether the power of two bulbs will be same or not if they are connected in series? Analyze it. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N. B.— Answer all the questions. Each question carries one mark. Block fully, with a ball point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for the Multiple Choice Questions Examination.]

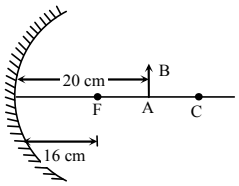
Candidates are asked not to leave any mark or spot on the question paper.

1. What is the rate of change of distance travelled?
a Displacement
b Speed
c Velocity
d Acceleration

2. Which instrument is used to measure the diameter of a solid thin wire?
a Meter scale b Screwgauge
c Slide Calipers d Vernier scale

3. The reason for red roses look red is —
i. only red colour is reflected
ii. absorb all colors except red
iii. the wavelength of red light is more
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

Answer the questions no. 4 and 5 according to the below information:



4. At what distance the image is formed from pole?
a 80 cm
b 40 cm
c 16 cm
d 10 cm

5. If AB is announced 10 cm to the tube of mirror then —
i. vitual image is formed
ii. image is furmod twlve of object
iii. erect image is formed
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. Which one is the most common form of energy?
a Mechanical energy
b Chemical energy
c Light energy
d Kinetic energy

7. What is the speed of pushing a box without turning is upside down?
a Vibrational moties
b Translational motion
c Periodic motion
d Circular motion

8. If the 10 divisions of vernier scale is equal to 9 divisions of main scale, what is the value of vernier constant?
a 0.01 mm b 0.1 mm
c 0.11 mm d 0.12 mm

9. Where is the radius of curvature of plane mirror situated?
a In principal focus
b In fous plane
c In secondary focus
d At infinity

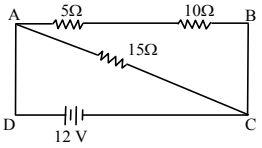
10. Which one is the dimension of power?
a MLT^{-2} b ML^2T^{-2}
c $ML^{-1}T^{-3}$ d ML^2T^{-3}

11. How is resistence related with the area of cross-section?
a Inversely proportionate
b Proportionate
c Square of inversely proportionate
d Square root of inversely proportionate

12. What is the value of the wavelength of visible light?
a 400 nm – 500 nm
b 400 nm – 600 nm
c 400 nm – 700 nm
d 500 nm – 700 nm

13. If an object of length 5 cm is placed at the centre of curvaure of concave mirror then —
i. the linear magnification is
ii. the size of image is diminished
iii. the nature of image is real and inverse
Which one is correct?
a i b ii
c i and iii d i, ii and iii

Answer the question no. 14 and 15 according to the below figure



14. What is the value of equivalent resistance of this circuit in ohm?
a 15 b 12
c 7.5 d 2.61

15. For this circuit —
i. the flow of current is 1.6 A
ii. If all the resistances are connected in parallel, the flow of current will be 5.29 A
iii. the resistance of AB part is smaller than that of AC part
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

[N.B.: Correct answer is (i)]

16. how much electricity can flow directly through the heart to kill a person?
a 5 mA b 8 mA
c 10 mA d 20 mA

17. Which formule is used for throwing a object?
a $v^2 - v^2 - 2gh$ b $v = u + gt$
c $v^2 = v^2 - 2gh$ d $h - vt + \frac{1}{2}gt^2$

18. How fast will an object his the ground if it is released from the root of 40 m high building?
a 784 ms^{-1} b 28 ms^{-1}
c 19.79 ms^{-1} d 14 ms^{-1}

19. Which of the followig indistress the linear distance between the beginning and the and of an object moving in a circular path?
a Displacement
b Travelling distance
c Velocity
d Speed

20. What is the value of potential difference of commonly used cell?
a 4.5 V b 3.6 V
c 1.5 V d 1.25 V

21. What is the degree to which the two mirrors do not change right-left when used as mirros with each other?
a 45° b 60°
c 90° d 120°

22. Which one is the resistivity of copper?
a 1.6×10^{-8} Ωm
b 1.68×10^{-8} Ωm
c 2.44×10^{-8} Ωm
d 5.5×10^{-8} Ωm

23. If the kinetic energy becomes 4 times of the body of fixed mass how many times of velocity of that body?
a $\frac{1}{4}$ b $\frac{1}{2}$
c 2 d 16

24. If three resistances of 2Ω are connected in parallel, what is the value of equlvalent resistance?
a 6 b 4
c 0.55 d 0.67

25. 100W – 220V is marked on a bulb, this means —
i. the resistance of bulb is 484Ω
ii. the bulb transferred 100J electrical energy into hight energy per second
iii. the flow of current through the bulb is 0.455 A
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

Ans.																									
	1	b	2	b	3	a	4	a	5	b	6	a	7	b	8	b	9	d	10	d	11	a	12	c	13	c
	14	c	15	*	16	c	17	c	18	b	19	a	20	c	21	c	22	b	23	c	24	d	25	d		

24. Chattogram Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B.— The figure in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The smallest division of the main scale of a slide calipers is 1mm and 19 divisions of the main scale equals 20 divisions of Vernier scale. The length of a square shaped object is measured by that scale. Here main scale reading is 15mm, Vernier coincidence is 16. Error in measurement is 5%.

a. What is the least count of the screw gauge? 1

b. If the absolute error is same while measuring different lengths, the one with the longest length will be more accurate in measure — Explain. 2

c. Determine the length of the square object. 3

d. What will be the percentage of error in measuring the area of the square-shaped object? Analyse mathematically. 4

2. ▶ A batsman hits a ball of 250gm mass and the ball gets 40.5J energy and goes straight up. A fielder from 40m distance runs with $10ms^{-1}$ velocity to catch the ball at that moment.

a. What is circular motion? 1

b. Explain the transformation of energy when a cradle is pulled to one end and it reaches the other end when released. 2

c. Determine the velocity of the ball at the moment it is going up. 3

d. Will the batsman be out caught? Explain mathematically. 4

3. ▶

Time (s)	0	1	2	1	3
Velocity (Ms^{-1})	0	5	10	15	20

The velocity of different time periods of a vehicle is listed in the table above.

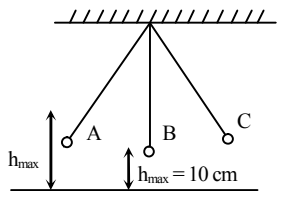
a. Write down the first law on falling objects. 1

b. If an object is lifted higher and then dropped, it will hit the ground with more velocity than before — Explain. 2

c. Determine the amount of work in case of the car. 3

d. analyse the velocity of the vehicle by drawing a graph on displacement — time. 4

4. ▶



The mass of the hanging object is 50gm

a. What is mechanical energy? 1

b. The more you compress a certain spring the more energy is required — Explain. 2

c. Determine the object's kinetic energy at position B. 3

d. Compare the object's velocity at points A, B and C. 4

5. ▶ You are watching your image standing in front of a plane mirror. You notice that if you advance towards the mirror, your image also comes closer to it. Your height is 5 feet.

a. Write down the first law of reflection. 1

b. Why cannot we see the ray while doing an X-ray? Explain. 2

c. Determine the magnification of your image. 3

d. Explain the logic of your image's coming towards the mirror with the help of a ray diagram. 4

6. ▶

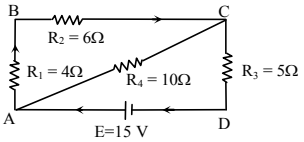


Fig : Circuit

a. What is Rheostat? 1

b. How can the specific resistance of a certain conducting cable be increased? Explain. 2

c. Determine the equivalent resistance of a circuit. 3

d. Are the potential differences of R_3 and R_4 equal? Give your opinion mathematically. 4

7. ▶ There are three 70W fans and five 20W light bulbs in Tomal's house. The fans and light bulbs remain operational for 15 hours and 8 hours respectively everyday. Their house is connected to 220V electricity supply line.

a. What is 1 kilo Watt-hour? 1

b. Why is there some system loss while electrical supply in distant areas? Explain. 2

c. Determine the resistance of a light bulb. 3

d. how many units of electrical energy will be spent for the fans and light bulbs at Tomal's house? Analyse. 4

8. ▶ You and your friend are standing 15cm away from two opposite types of miorrors. Your image is produced on a screen 15cm away from the mirror. But your friend's image, though at the same distance, cannot be produced on the screen.

a. What is magnification? 1

b. Why is convex mirror used for the side view mirror in vehicles? Explain. 2

c. Determine the focal length of the first mirror. 3

d. Explain with the help of a ray diagram why the images of you and your friend are different. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N.B.— Answer all the questions. Each question carries one mark. Block fully with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions examination.]

Candidates are asked notto leave any mark or spot on the question paper.

1. What type of motion is the motion of an electric fan?
a Linear motion
b Circular motion
c Elliptical motion
d Vibratory motion

2. Which of the following is a vector quantity?
a Work and velocity
b Displacement and density
c Distance and acceleration
d Momentum and force

3. The velocity of a body starting from rest with uniform acceleration is — the distance.
a proportional to
b proportional to the square of
c inversely proportional to the square of
d proportional to the square root of

4. Flow of charge with respected to time is called—
a potential b electric current
c resistance d conductivity

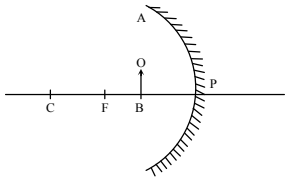
5. What is the unit of retardation?
a ms^{-2} b ms^{-1}
c kgs^{-1} d kgs^{-2}

6. What is the dimention of power?
a MLT^{-2} b $ML^{-2}T^{2}$
c $ML^{2}T^{-2}$ d $ML^{2}T^{-3}$

7. What kind of energy is stored if a body is lifted from the earth surface?
a Kinetic energy
b Potential energy
c Heat energy
d Chemical energy

8. If we consider from the viewpoint of quantity most of the energy in the world is converted from which of the following?
a Electric energy
b Chemical energy
c Light energy
d Heat energy

From the figure below, answer questions no. 9 and 10:



Length of the object AB = 50 cm, Magnification = 3

9. According to the above figure, what is the length of the image?
a 0.1667 cm b 1.5 m
c 15 cm d 16.67 m

10. Which of the following is correct in case of image of the object AB?
a Real and inverted
b Real and diminished
c Virtual and magnified
d Real and upright

11. A body of mass m is kept at a height of 20m, 30m, 40m and 50m respectively. From which height, if the body is released then the kinetic energy will be maximum?
a 20m b 30m
c 40m d 50m

12. In case of measurement —
i. relative error = $\frac{\text{Absolute error}}{\text{Measured value}}$
ii. Vernier constant = $\frac{\text{Smallest division of main scale}}{\text{Total divisions of Vemier scale}}$
iii. least count = $\frac{\text{Total divisions of circular scale}}{\text{Pitch}}$
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

From the graph below, answer questions no. 13 and 14:

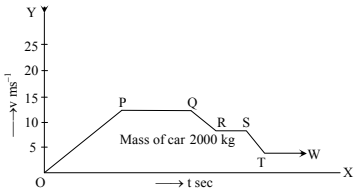


Figure : Velocity — time graph

13. In which part of the graph, the velocity increases proportionally?
a Part OP b Part PQ
c Part RS d Part TW

14. What is the maximum kinetic energy?
a 4.5×10^{4}J b 5×10^{4}J
c 2.25×10^{5}J d 4.5×10^{5}J

15. Two persons of masses 40kg and 80kg are running with a velocity $8ms^{-1}$ and $4ms^{-1}$ respectively. Which of the following is correct in case of the two persons?
a The kinetic energy of the 1st person is half of the 2nd person
b The kinetic energy of the 1st person is four times of the 2nd person
c The kinetic energy of the 1st person is twice of the 2nd person
d The kinetic energy of the 2nd person is twice of the 1st person

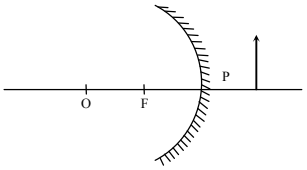
16. What is the wavelength of visible light of human eye?
a Less than 400 nm
b More than 700 nm
c 400 nm to 600 nm
d 400 nm to 700 nm

17. Which colour of light has the lowest wavelength?
a Red b Blue
c Violet d Yellow

18. The characteristics of the image formed in a plane mirror —
i. image is virtual and erect
ii. image is virtual and equal to the object
iii. the distance between the mirror and image is half of the distance between the mirror and the object
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

19. Where convex mirrors are used?
a Cars b Radar
c Solar oven d Torch light

20.



The image occurs in case of the above mirror —
i. diminished and straight
ii. magnified and straight
iii. virtual and straight
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

21. Which of the following is the most of conductivity?
a Copper b Silver
c Gold d Graphite

22. Which of the following relation is correct?
a $V = \frac{R}{I}$ b $R = \rho \frac{A}{L}$
c $\rho = R.\frac{A}{L}$ d $A = \frac{R\rho}{L}$

Answer the questions no. 23 and 24 according to the information given below :
60W is written on a bulb of 220V.

23. What amount of electric current is following through the bulb?
a 0.27 A b 3.67 A
c 27 A d 36.7 A

24. The price of each unit is Tk. 10. How much will be the electric bill for the month of January if the bulb is used for 5 hours everyday?
a Tk. 93 b Tk. 92
c Tk. 91 d Tk. 90

25. In case of potential difference, resistance and electric currect —
i. the less the value of potential difference, the less will be the value of electric current
ii. if the value of potential difference is negative then the direction of electric current will change
iii. if the resistance is high, the flow of electricity will be low
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Ans.																										
	1	b	2	d	3	d	4	b	5	a	6	d	7	b	8	d	9	b	10	c	11	d	12	a	13	a
	14	c	15	c	16	d	17	c	18	a	19	a	20	b	21	d	22	c	23	a	24	a	25	d		

25. Sylhet Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ Physics teacher went with the student in the laboratory to determine the diameter of a wire with the help of instrumental errorless slide calipers and in the 1st slide calipers he got the main scale reading 1.6cm; The diameter of the wire was found to be 1.65cm and 1.655cm in the 1st and 2nd instruments respectively. When the students want to know the reason for the different values of measurement, the teacher explain it. Vernier's divisions of the 1st and 2nd scale is 10 and 20 respectively.

a. What is called the pitch of the screw? 1
b. Explain the importance of unit of measurement. 2
c. Determine the Vernier coincidence in the case of 1st slide calipers. 3
d. Analyze the reason for the difference in the reading obtained in the two instruments. 4

2. ▶

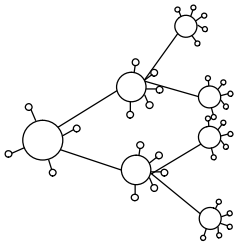
Time (s)	0	20	40	60	80	100	120
Velocity (ms^{-1})	0	4	8	12	12	6	0

a. What is called periodic motion? 1
b. Explain that the average velocity of an object is zero, the average speed may not be zero. 2
c. How much distance will the vehicle travel in 1 minute 20 second? 3
d. By the data of stem draw velocity — time graph and explain the different condition of motion. 4

3. ▶ A motor of power 1KW and efficiency 70% is used for lifting up water for a height of 30m. Another motor of power 2 KW can lift up 1000kg of water at a height of 10m in 2 minutes.

a. What is called kinetic energy? 1
b. What do you mean by 200MW capacity of an electric power station? Explain. 2
c. Find what amount of water the first motor can lift up in 5 minutes? 3
d. Which motor will you select for the purpose of lifting water? Explain your opinion. 4

4. ▶ Observe the figure and answer the following questions :

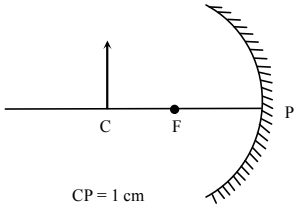


a. What is called renewable energy? 1
b. Explain the relation between mass and energy. 2
c. How does the energy disintegrated from the above system? Explain. 3
d. Describe what are the bad effects of using the discussed energy and how can we be safe from that. 4

5. ▶ A runner start journey from rest with an acceleration of $0.05ms^{-2}$ for the specific destination of 150m. Another runner start journey with the same destination, 50m ahead of the 1st runner with a uniform velocity of $2ms^{-1}$.

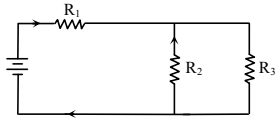
a. What is called Vernier constant? 1
b. "There is no acceleration when object moving with uniform velocity."— Explain." 2
c. After what distance travel by the 1st runner the velocity of both runner will be same. 3
d. Which runner will reach the destination first? Explain mathematically. 4

6. ▶ Observe the figure and answer the following questions:



a. What is called irregular reflection? 1
b. What is meant by the virtual image? Explain. 2
c. Calculate the linear magnification from the above information. 3
d. What type of image will be formed, if the mentioned object placed in front of above mirror at a distance of 0.2cm? Explain with ray diagram. 4

7. ▶ Observe the figure and answer the following questions:



a. What is called electromotive force? 1
b. What is meant by system loss of electricity? 2
c. If $R_1 = R_2 = R_3 = 5\Omega$ and supplied electromotive force is 7.5 volt, what is the current in the circuit? 3
d. Draw a circuit diagram for household uses by the above circuit including switch and fuse and explain the usefulness of that circuit. 4

8. ▶ A technician has given the demand of the following electrical equipment for the connection of a room in the newly made house.

1. Three-pin socket (Two pieces)
2. Two-pin socket (Two pieces)
3. Switch (Four pieces)
4. Light of 25W (Two pieces)
5. Fan (One piece)
6. Electric wire.

a. What is called semiconductor? 1
b. What do you mean by electromotive force? Explain. 2
c. Determine how much energy will spend if two lights used for 4 hours. 3
d. Draw a circuit diagram by using the above electrical equipment. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N.B.— Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions Examination.]

Candidates are asked not to leave any mark or spot on the question paper.

1. What will be the nature of the image when an object placed at a distance more than twice focal length of concave mirror?
a Real and inverted
b Real and erect
c virtual and inverted
d Virtual and erect

2. Which one is made by a convex mirror?
a Torch light
b Search light of launches
c Rear view mirror
d Laser

3. Which one is correct for convex mirror?
a $m = 1$ b $m > 1$
c $m < 1$ d $M \geq 1$

4. At which angle a plane mirror will be needed to place to view the turning of road?
a 30° b 45°
c 60° d 90°

5. What is the wavelength of microwavel light?
a 10^{-6} m b 10^{-2} m
c 10^{2} m d 10^{6} m

6. How much light will reflect when light falls on normal glass?
a 0.4% — 0.5%
b 4% — 5%
c 14% — 15%
d 24% — 25%

7. Which is derived quantity?
a Length b Mass
c Time d Force

8. Which one is radius of solar system?
a 6×10^{6} m b 6×10^{12} m
c 6×10^{6} km d 6×10^{12} km

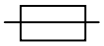
9. The scientists understood that actually the atoms are —
i. not impersihable
ii. may emit radioactive radiation on disintegration
iii. radiate its energy and fall into the nucleus
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

10. What will be the focal length in cm if radius of curvature of convex mirror is 10cm?
a +20 b +5
c –5 d –20

11. Which relation is correct?
a $V = QW$ b $W = \frac{V}{Q}$
c $Q = WV$ d $W = VQ$

12. What is the another name of BOT?
a Jule b Watt
c KiloWatt d Unit

13. What is the kinetic energy is Joule (J) if a motor cycle run with a velocity of 50 kmh^{-1}?
a 8680.56 b 17361.11
c 112500 d 225000

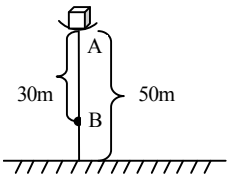
14.  symbol indicate what?
a Cell b Capacitor
c Fuse d Light

15. What is the name of the instrument that measuring potential difference?
a Galvanometer b Generator
c Ammeter d Voltmeter

16. Where convex mirrors are used?
a Solar Oven
b Torch light
c Radar
d View Mirror of a car

17. Renewable energy is —
i. wind energy
ii. bio fuel
iii. coal
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

18. Which is unit of work?
a Nm b Nm^{-1}
c NS d $Kgms^{-1}$

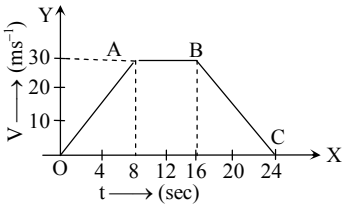


A body of 10kg remain in point A.

From the above figure, answer the questions no. 19 and 20 :

19. Determine the potetial energy at point A.
a 1960 Jule b 2940 Jule
c 4900 Jule d 14700 Jule

20. Determine the ratio between potential and kinetic energy at point B.
a 1 : 3 b 2 : 3
c 3 : 2 d 2 : 1



From the above figure, answer the questions no. 21—23 :

21. What does AB indicate for?
a Uniform velocity
b Rest
c Uniform acceleration
d Motion

22. What distance will be in the QA part?
a 30 m b 120 m
c 240 m d 480 m

23. Which one is correct?
a AB uniform acceleration and BC uniform velocity
b AB uniform velocity and BC uniform acceleration
c OA uniform acceleration and AB uniform velocity
d OA uniform acceleration and AB uniform acceleration

24. Which is the dimension of acceleration?
a LT^{-1} b LT^{-2}
c $ML^{-1}T^{-2}$ d MLT^{-2}

25. Velocity is changed —
i. by the change of magnitude
ii. by the change of direction
iii. by the change of both magnitude and direction
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Ans.																													
	1	a	2	c	3	c	4	b	5	b	6	b	7	d	8	b	9	a	10	c	11	d	12	d	13	a			
	14	b	15	d	16	d	17	a	18	a	19	c	20	b	21	a	22	b	23	c	24	b	25	d					

26. Jashore Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The main scale reading for measuring the diameter of a sphere with slide callipers was found to be 7.3 cm, vernier coincidence 8, vernier constant was 0.1 mm and another hollow cube with length = breadth = height = 6 cm.

a. What is pitch? 1

b. Why is it not possible to measure accurate length of any object with meter scale? 2

c. Calculate the value of the diameter of the sphere. 3

d. Is it possible to insert the sphere into the cube? Explain it mathematically. 4

2. ▶ To go on educational tour, students of the two schools started their journey by two buses A and B in the same direction at the same time. the A bus reached with uniform acceleration of 4×10^{-3} kms^{-2} and the B bus reached the destination with uniform velocity of 4×10^{-2} kms^{-1}.

a. What is vector quantity? 1

b. Why acceleration due to gravity is an uniform acceleration? Explain. 2

c. When the velocities of two buses will be equal after starting their journey? 3

d. How many times will the students of the two buses meet on the way? Explain mathematically. 4

3. ▶ An air passenger dropped a stone of 6kg while aircraft was 220m above the ground. The stone falls directly to the ground.

a. Define mechanical energy. 1

b. What kind of work to climb up the escalator? Explain. 2

c. At what height from the ground the kinetic energy of the stone will become one-fifth of the potential energy? 3

d. What will be the change in total energy at a height of 40m from the ground and 5s after the stone is dropped from the plane? Show through mathematical analysis. 4

4. ▶ Observe the figures below and answer the following questions :

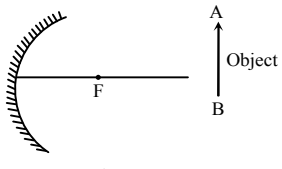


Figure-1

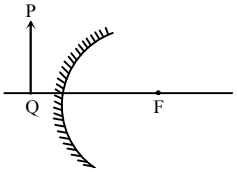


Figure-2

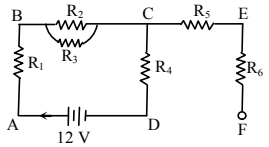
a. Write down the first law of reflection of light. 1

b. Why concave mirror is used for the dental treatment? Explain. 2

c. If you want to get m−1 in figure−1, where the object is to be placed? Explain is with diagram. 3

d. Explain the characteristics of the object PQ from figure-2 with rays diagram. 4

5. ▶ Observe the figure and answer the following questions:



In figure, $R_1 = 4\Omega$, $R_2 = R_3 = 8\Omega$, $R_4 = 2\Omega$, $R_5 = 3\Omega$, $R_6 = 1\Omega$

a. Define 1Ohm. 1

b. Why specific resistance and conductivity are opposite? 2

c. Find out the value of the current passing through R_3. 3

d. Will the potential difference across BC and CE be equal of the circuit? Explain it mathematically. 4

6. ▶ A bullet penetrated 2 cm of a tree with the velocity of 30 ms^{-1}, The thickness of tree is 6.5 cm. The velocity of the bullet is decreased by one-third after penetrating 2cm. After that, the bullet moved for 1 sec.

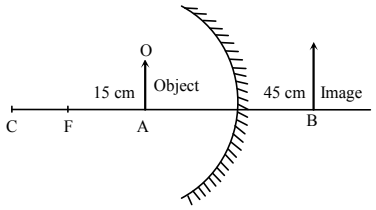
a. Write down one equation of equation of motion. 1

b. Why the acceleration of throwing object is negative? Explain it. 2

c. Find out the value of acceleration of the bullet. 3

d. Will the bullet be able to penetrate the tree? Explain it mathematically. 4

7. ▶ Observe the figure below and answer the following questions :



a. What is irregular reflection? 1

b. Why is convex mirror called diverging mirror? Explain it. 2

c. Determine the magnification of the object mentioned in the stimulus. 3

d. Explain the size of the image if the object is placed between C and F and out side C in front of the stimulus mirror by drawing ray diagram. 4

8. ▶ Three electric fans of 100W and four bulbs of 60W are connected with the potential difference of 220V in an office. Three fans and four bulbs run 6 hrs and 8 hrs respectively per day.

a. What is insulator? 1

b. Why the resistance of the conductor is increased with the increase of length? Explain it. 2

c. Find out the value of resistance of a bulb used in a night. 3

d. Which one will consume more electric energy between a fan and a bulb used in a month? Explain mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N.B.— Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions Examination.]

Candidates are asked not to leave any mark or spot on the question paper

1. Which of the following is a vector quantity?
a Speed b Work
c Potential d Electric current
[**N.B.:** None of the options is correct]

2. What type of mirror is used as the rear view mirror in the vehicles?
a Concave b Convex
c plain d Convergent

3. A child is swinging in a cradle
Which is right in case of the child?
a Kinetic energy is maximum at the maximum height
b Velocity is the lowest during equilibrium state
c Potential energy increases towards either way at equilibrium
d Total energy is less at the highest height from the equilibrium state

4. In case of determining the thickness of a rectangular glass plate, main scale treading is 18 mm and verner constant is found 8. If the vernier constant of the tool is 0.01 cm, what is the thickness of the glass plate?
a 8.1 mm b 8.18 mm
c 18.08mm d 18.8mm

5. What is the specific resistance of gold?
a $2.5\times10^{-6}\Omega$m b $2.44\times10^{-8}\Omega$m
c $1.68\times10^{-8}\Omega$m d $1.59\times10^{-8}\Omega$m

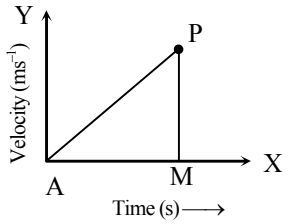
Answer the questions 6 and 7 in light of the following stem:
A toy car of mass 1kg is moving on a frictionless floor at $1ms^{-1}$ velocity. You push the car towards its motion with 1N force.

6. How much distance the toy car will go 10s after your path?
a 110m b 100m
c 60m d 50m

7. In this incident after 5s —
i. the kinetic energy of the toy car will be 18J
ii. amount of work done by you is 17.5J
iii. difference of energy is 17.5J
Which one is correct?
a i b ii
c iii d i, ii and iii

8. Vernier constant is —
a The difference between the length of the smallest division of the main scale and one division of vernier scale
b The ratio of the length of the smallest division of the main scale and one division of vernier scale
c The length of one division of vernier scale
d The length of the smallest division of the main scale

9.



The figure's AP line's slope is —
a Uniform velocity
b Uniform accelecration
c Non uniform acceleration
d Non uniform force

10. What is the required velocity for an object to be thrown straight upwards so that it falls to the ground after 10?
a $4.9ms^{-1}$ b $9.8ms^{-1}$
c $49ms^{-1}$ d $98ms^{-1}$

11. A vehicle moves 6m straight northwards from its position and from there moves 8m further eastwards straight. What is the difference between the vehicle's travelled distance and displacement?
a 24m b 8.71m
c 4m d 2m

Answer the questions no. 12 and 13 in light of the following stem:
If an object is placed 5m away from a mirror it produces a virtual image.

12. What is the focal length of the mirror?
a 7.5 m b 1.875m
c 0.533m d 0.133m

13. In the stem —
i. The mirror is concave
ii. If the object is placed in infinite distance, the distance of the image will be 7.5m
iii. If the mirror is opposite type, the image will be real and magnified
Which of the following is correct?
a ii b iii
c i and ii d i and iii

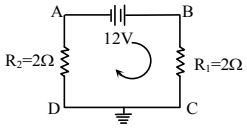
14. What is the dimention of velocity?
a LT^{-2} b $L^{-1}T$
c $L^{-1}T^{2}$ d LT^{-1}

15. A passenger of a running bus is —
i. in rest relative to the bus
ii. in rest relative to a lamp pod
iii. in rest relative to the other passengers
Which of the following is right?
a i b i and iii
c ii and iii d i, ii and iii

16. How a green flower is viewed in red light?
a Black b Yellow
c Red d Colorless

17. In case of a falling object —
i. Kinetic energy keeps increasing continuously
ii. Acceleration keeps increasing continuously
iii. Potential energy keeps decreasing continuously
Which one is correct?
a i b iii
c i and iii d i, ii and iii

Answer the question 18 and 19 in the light of the following stem:



18. What is the electric current through R^2 in the circuit?
a 0.5A b 2A
c 3A d 6A

19. In case of this circuit —
i. potential of point A is 4V
ii. potential difference between points C and D is zero
iii. power of R_2 is SW
Which of the following is correct?
a i b ii
c ii and iii d i, ii and iii

20. The velocity of a vehicle is increasing at the rate of $0.4ms^{-1}$, $0.8ms^{-1}$, $1.2ms^{-1}$ and $1.6ms^{-1}$. The vehicle is moving in —
a uniform acceleration
b uniform momentum
c uniform velocity
d non-uniform acceleration

21. What is the motion of an object oscillsting by a spring?
a Periodic motion
b Circular motion
c Translational motion
d Sinuous motion

22. A moving object's kinetic energy will be 27 times if the object's —
a mass is 9 times and velocity 3 times
b momentum is 3 times
c both mass and velocity will be 3 times
d mass in 3 times and velocity 9 times

23. What is the source of renewable energy?
a Oil b Nuclear
c Geothermal d coal

24. Which of the following is semi-conductor?
a Glass b Gold
c Rubber d Germanium

25. What is used in a nuclear reactor to absorbe neutron?
a Control rod b Proton
c Uranium d Neutrino

Ans.																											
	1	*	2	a	3	c	4	d	5	b	6	c	7	d	8	a	9	b	10	c	11	c	12	a	13	a
	14	d	15	b	16	a	17	c	18	b	19	c	20	a	21	a	22	c	23	c	24	d	25	a		

27. Barishal Board-2021

Physics

Subject Code | 1 | 3 | 6 |

Time — 2 Hours 35 Minutes

Creative Essay Type Questions

Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ Observe the two figures and answer the questions:

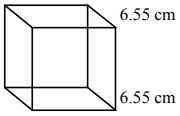


Fig 1 : Cube

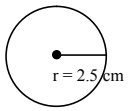


Fig 2: Solid ball

a. Define Vernier constant. 1
b. Why we use Vernier scales i slide calipers? 2
c. What would be the volume of the empty space when stem's solid ball inserted in the cube? 3
d. Whether the both pictures of the stem can be measured by metre scale, explain it logically. 4

2. ▶ For a moving car velocity — time informations are given below :

Time (sec)	0	5	10	15	20	25	30	35	40
Velocity (m/sec)	0	5	10	15	20	20	20	15	10

a. Define uniform acceleration. 1
b. Why vector quantities need magnitudes and direction to express it? 2
c. Calculate the distance travelled by the car for first 30 seconds. 3
d. Draw a acceleration Vs time graph and explain the nature of acceleration from graph. 4

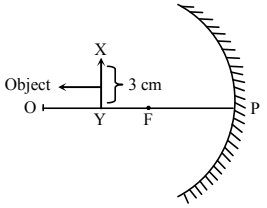
3. ▶ Two electric motors having powers 10kW and 8kW respectively can lift 400kg rod and 1000 litre water at a height of 20m of a house roof in 30s.

a. Define potential energy. 1
b. Why is biomass called renewable energy? Explain. 2
c. Find out the work done by the first electric motor. 3
d. Which motor has more efficiency from the two motors? Analyse mathematically. 4

4. ▶ Sumon collected a spring to through an object of mass 10kg at a height of 20m. He compressed the spring 8cm by doing 800J work. But the spring did not able to throw the object at that height. Then Sumon compressed the spring more so that he can throw the object to that desire height.

a. Define efficiency. 1
b. Explain the relation between momentum and kinetic energy. 2
c. If the work done by the object is same as the spring then how much distance the object will go along the land. [Force o the object is 20N] 3
d. By how much compression of the spring Sumon will be able to throw the object at the desire height? Analyse mathematically. 4

5. ▶ Look at the stems and answer the questions given below:

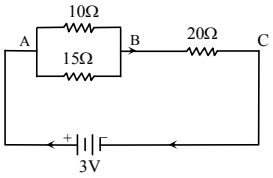


a. Define image. 1
b. Why we cannot see lights of any wavelength? 2
c. If magnification of the mirror is 1.5 the find out the length of image in meter. 3
d. if the stem's object is placed at a point between F and P then what would be the position, nature and size of the image — analyse by drawing a ray diagram. 4

6. ▶ A fan of 75 Watt, a bulb of 60 Watt, a refrigerator of 500 Watt and a fuse of 5 Amp were brought as equipment for an electrical connection in a room. The room will be connected to a 220 Volt power line.

a. State Ohm's law. 1
b. Write the difference between electromotive force and voltage difference. 2
c. Determine the amount of electricity flowing through the fan. 3
d. Draw a circuit diagram by using the stem's equipments for a room and explain its usefulness. 4

7. ▶



a. What is called potential difference? 1
b. Why system loss occurs in electricity? Explain it. 2
c. Determine the potential difference between B and C. 3
d. How can you rearrange the resistances of the circuit to get an equivalent resistance 10Ω? Draw the circuit and analyse it mathematically. 4

8. ▶ A boy throws an object of mass 2kg upwards at a starting velocity vertically $9.8ms^{-1}$.After reached the highest position it back to the earth surface.

a. What is called mean speed? 1
b. The displacement does not depend on the way of the path". Explain it. 2
c. What would be the maximum height of the stem's object? 3
d. If the stem's object threw upwards with half of its initial velocity, explain the phenomena with the help of conservation of energy. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[N.B.— Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions Examination.]

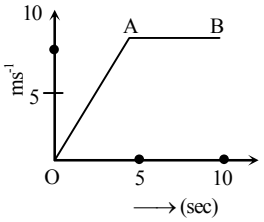
Candidates are asked not to leave any mark or spot on the question paper

1. A scale can be used to measure minimum 1 mm only. What will be the absolute error of measurement by the scale?
a 0.1 mm b 1 mm
c 0.05 cm d 0.5 cm

2. Vernier constant in a slide calipers is 5 × 10^{-3} cm. What is the number of divisions in the Vernier scale of the slide calipers?
a 10 b 20
c 30 d 50

3. Relative error is —
i. a kind of ratio
ii. actual measurement of error
iii. smaller in Vernier scale compared to normal scale
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

4.



In the above figure —
i. In the part of OA uniform acceleration are existed
ii. In the part of AB travelled distance is 50 m
iii. In the part of OA, the car is in uniform velocity
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Answer the questions no. 5 and 6 from the stem below:
An object start to move in a circular path of radius 4 cm. It starts to move from point A and come back to the same point A. In this time 100N force acts on it.

5. What is the distance in mitre travelled by the object?
a 25.13 b 8
c 4 d 0

6. The work done by the object is —
a 25l3J b 800J
c 400J d 0J

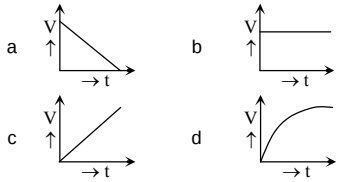
7. Which is vector quantity from the below?
a Temperature b Work
c Force d Mass

8. Which one is the dimension of potential energy?
a ML^2T^{-2} b MLT^{-2}
c MLT^{-1} d ML^2T^{-1}

9. Which one below is correct for falling bodies?
a $v \propto t^2$ b $h \propto t^2$
c $h \propto t$ d $t \propto v$

10. Rate of change of velocity of freely falling body is called —
a Work
b Speed
c Acceleration
d Acceleration due to gravity

11. Which one is the velocity — time graph for an object moving with uniform acceleration?



12. Which is a non-renewable energy from below?
a Methane b Biofuel
c Biomass d Wind energy

13. Unit of energy —
i. Joule
ii. Newton-metre
iii. Watt
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

14. How much energy is produced per hour by a 50 MW power plant?
a 1.38×10^4 J b 8.3×10^5 J
c 3×10^9 J d 1.8×10^{11} J

15. If we want to increase kinetic energy 9 times of an object then we should —
i. work 9 times
ii. increase velocity 3 times
iii. increase distance 9 times
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

16. Nuclear power plant is hazardous for the environment, because —
i. Nuclear wastages are very radioactive
ii. It emits Carbon dioxide gas
iii. We must reserve the wastages for millions of years to reach the safe level
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

17. The value of magnification may be 1 in a —
i. plane mirror
ii. concave mirror
iii. convex mirror
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

18. A concave mirror has a radius of curvature 100 cm. What is the focal length of it?
a – 2m b – 0.5m
c + 0.5m d + 2m

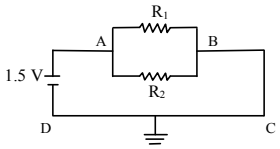
19. Which one is the light of shortest wave length?
a Gamma ray b X-ray
c Infrared d Radio wave

20. Specific resistance of a specific wire depends on which quantity from below?
a Temperature b Length
c Area d Volume

21. How many 100Ω resistor should be connected in parallel to get equal equivalent resistance of two 5Ω resistors connected in series?
a 5 b 10
c 20 d 40

22. What is the voltage of a neutral wire in electric supple line?
a 220V b 180V
c 5V d 0V

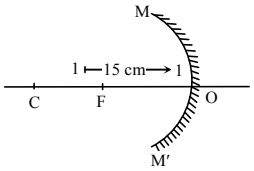
23.



In the above circuit —
a The potential difference is same at the part of AB
b IFR_1 = R_2 then the power will be different
c If $R_1 \neq R_2$ then same current will be flow
d The potential is 1.5V at the point C and D

24. Which one of below is a semi-conductor?
a Glass b Silicon
c Nichrome d Diamond

25.



In the above stem if the object is placed in front of 10 cm from the mirror, where the image will be formed?
a At the centre of curvature
b At the focus
c Between the pole and the focus
d Between the centre of curvature and focus

Ans.																									
	1	d	2	b	3	b	4	a	5	a	6	d	7	c	8	a	9	b	10	d	11	c	12	a	13	a
	14	d	15	a	16	b	17	a	18	c	19	a	20	a	21	b	22	d	23	a	24	b	25	a		

28. Dhaka Board-2020

Physics

Subject Code: | 1 | 3 | 6 |

Time — 2 hours 35 minutes

Creative Essay Type Questions

Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ In summer a beverage seller want to make a beverage of temperature 15°C. For this reason he mixed 20kg of water of temperature 35°C with 0°C temperature's some ice. [Latent heat of ice melting is 3,36,000 Jkg^{-1} and specific heat of water is 4200 $Jkg^{-1}K^{-1}$]

a. What is the co-efficient of linear expansion? 1
b. Where the water is rapidly evaporated when the same amount of water is placed inside a glass and a bucket? 2
c. Determine the ratio of velocity of water and beverage. 3
d. Whether the ice is fully melting or not when the man mixed 6 kg ice for making beverage where the mixture temperature is fixed. Analyze mathematically. 4

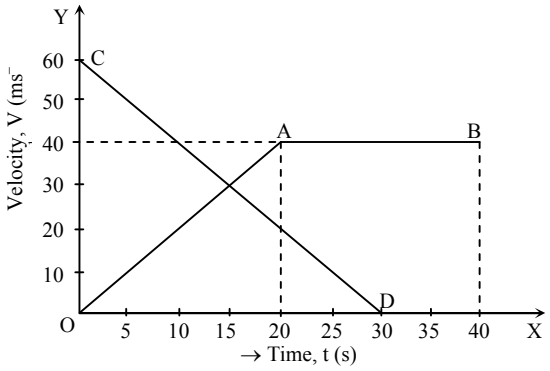
2. Mina's grandmother starts to use glasses because her eyes lens power is decreased. The refractive index of the glass is 1.56.

a. What is the principle axis of mirror? 1
b. Explain why the movie screen is white? 2
c. Determine the critical angle of the material of glasses. 3
d. Discuss with ray diagram the reason, effect and remedy of Mina's grandmother's eye problem. 4

3. ▶ The length, width and height of a brick is 25cm, 12cm and 6cm respectively. Mass of the brick is 2.25kg. Density of water is $1000kgm^{-3}$. [$g = 9.8ms^{-2}$]

a. Write down Hook's law. 1
b. Why the density of the water below and upper portion of the pond is different during hot sun? 2
c. Determine how much the maximum pressure acts on the surface by the brick. 3
d. Whether it is sink or float when a pieces of same size wood of density 400 kgm^{-3} placed in pair with the brick and put them into the water. Analyze mathematically. 4

4. ▶



The graph shows velocity vs time. From the graph OAB line for the first car and CD line for the second car.

a. What is periodic motion? 1
b. Why the travelling distance is not equal when same amount of force applied of different mass bodies? 2
c. Determine the acceleration of the first car. 3
d. Which car travelling more distance in 30s? Analyze mathematically. 4

5. ▶ 'A' and 'B' two electronic devices are used at various school events. 'A' device convert sound energy to electric energy and 'B' device convert electric energy to sound energy.

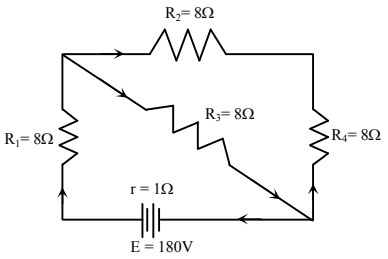
a. What is solenoid? 1
b. Why step-up transformer is used to transfer current for long distance? 2
c. Describe the activities of the device 'A' that mentioned in the stem. 3
d. Discuss the contribution of this two devices for broadcasting programs on the radio. 4

6. ▶ **Scene-1:** With a machine, 500kg of water was raised 50m height in 5 minutes. The efficiency of the machine is 45%.

Scene-2 : An object of 4kg mass was thrown upward with velocity $40ms^{-1}$. [$g = 9.8ms^{-2}$]

a. What is uniform acceleration? 1
b. Explain—Biomass is called renewable energy. 2
c. From scene-2 at what height the potential energy is double to the kinetic energy? 3
d. What will be the changing spent energy of the machine when its efficiency increases 10%? Analyze mathematically. 4

7. ▶



a. Write down Ohm's law. 1
b. Why generator is called the opposite device of motor? 2
c. Determine the lost voltage of the circuit. 3
d. Whether the power is equal or not when the magnitude of three resistance R_1, R_2 and R_3 are equal. Analyze mathematically. 4

8. ▶ Mass of an object is 5 kg and its position is steady. Now 5N force acts on this object for 4s. After 4s again 10N force acts on this object for 4s.

a. What is called wave? 1
b. Write the characteristics of the image which created in the plane mirror. 2
c. Determine the distance for first 8s of the object. 3
d. Analyze the motion of the object by drawing velocity vs time graph according to the information of the stem. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which one is the dimention of forece?
a $ML^{-1}T^{2}$ b MLT^{-2}
c $ML^{-1}T^{-1}$ d MLT^{-1}

2. A force of 125N is applied on a body of mass 10kg, its acceleration will be —
a 0.08 ms^{-2} b 12.5 ms^{-2}
c 135 ms^{-2} d 12.50 ms^{-2}

3. During measuring the length of a bar with Slide Calipers, the main scale reading is 6 cm, the vernier super-imposition is 7 and if the vernier constant is 0.1 mm, what is the length of the bar?
a 6.7 cm b 6.7 mm
c 6.07 mm d 6.07 cm

4. The velocity acquired by a freely falling body form the rest in a given time is —
a directly proportional to the square of that time
b inversely proportional to the time
c proportional to the time
d inversely proportional to the square of the time

5. Sun light is —
i. an electro magnetic wave
ii. one kind of transverse wave
iii. if frequency increases, velocity will increase
Which one of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. What type of energy is stored when a body is straightened?
a Kenetic energy b Potential energy
c Heat energy d Chemical energy

7. In the annual sports in his school, Karim completed one cycle around a circular path of radius 30 m. What will be his displacement?
a 188.49 m b 94.24 m
c 60 m d 0 m

8. The unit of Coulombo's constant is —
a $Nm^{2}C^{-2}$ b $Nm^{2}C^{-1}$
c $N^{-1}M^{-2}C^{2}$ d $Nm^{-2}C^{-2}$

9. At the time of crawling of babies on a carpet —
i. same type charges accumulates in his body
ii. hairs become straightened
iii. each hair attracts each other
Which of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

10. Which can be made by solar energy?
a Hydro electricity centre
b Neuclear electricity centre
c Thermal electricity centre
d Electricity

11. In case of magnetic lines of force —
i. they never intersect each other
ii. its number increases the magnetic energy
iii. it direction can indicate by using left handed rule
Which of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

12. Light is —
a a longitudinal wave
b electromagnetic wave
c transverse wave d mechanical wave

From the figure below anser to the question no. 13 and 14:

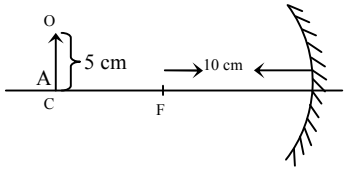


Figure- 1

13. What is the radius of curvature of the mirror?
a 10 cm b 15 cm
c 20 cm d 50 cm

14. The image of AO is —
i. virtual and straight
ii. real and inverted
iii. the value of linear magnification is 1
Which one of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

15. What is focal length of a lens of power + 5D?
a 20 cm b 20 cm
c 5 cm d 5 m

16. A charge of 5C is feeling a force of 15N. What is the electric field?
a 20 N/C b 10 N/C
c 3 N/C d 0.33 N/C

17. The potential difference between the two terminal of a conductor is 220V. If the amount of current flowing through it is 20A. What will be its resistance?
a 240Ω b 220Ω
c 11Ω d 0.0909 Ω

Answer to the question nos. 18 and 19 by the given information:

Time (S)	0	5	10	15	20	25	30
Velocity (V)	0	30	60	90	90	60	30

Change of velocity with time of a bus.

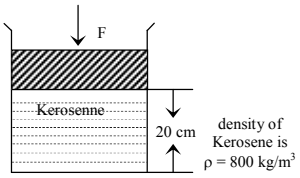
18. What is the acceleration of the bus within first 10 seconds?
a 6 ms^{-2} b $-6\ ms^{-2}$
c 0.17 ms^{-2} d $-0.17\ ms^{-2}$

19. The bus, which is mention in the stem —
i. moves with the same acceleration upto first 20 seconds
ii. gains a decceleration of 6 ms^{-2} within test 10 seconds
iii. has a zero initial momentum
Which of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

20. The number of turns in the primary coil of a transformer is 50 and the number of turns in the secondary coil is 500, 12V AC is applied in the primary coil, what is the voltage in the secondary coil?
a 6000 V b 600 V
c 120 V d 1.2 V

21. When ultrasound is used for examination of the heart, then this test is called —
a Ultrasonography
b Echocardiography
c Angiography d Angioplasty

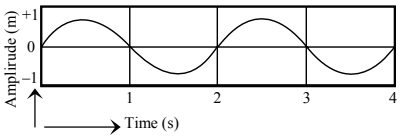
Answer to the question nos. 22 and 23 of the following figure:



22. How much pressure will be felt at the bottom of the pot?
a 1568 pa b 1960 pa
c 156800 pa d 196000 pa

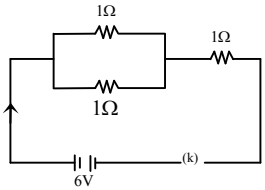
23. If force F is applied on the free surface of the pot, then this force —
i. depend on the mass of the liquid
ii. depend on tha area of the pot
iii. will exert a pressure in al direction of the vessel
Which one of the following is correct?
a i b iii
c ii and iii d i, ii and iii

24.



What is the frequency at wave of the figure?
a 5 HZ b 0.5 HZ
c 1 HZ d 2 HZ

25.



What will be the electricity of circuit?
a 1.5 A b 2 A
c 4 A d 6 A

Ans.																									
	1	b	2	b	3	d	4	c	5	a	6	b	7	d	8	a	9	a	10	d	11	a	12	b	13	c
	14	c	15	a	16	c	17	c	18	a	19	c	20	c	21	a	22	a	23	b	24	b	25	c		

29. Mymensingh Board-2020

Physics

Subject Code: | 1 | 3 | 6 |

Time — 2 hours 35 minutes

Creative Essay Type Questions

Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ Scenario-1 : By using slide calipers determining the length of a rod main scale reading is 4.2 cm and the length of the rod is 4.25 cm.
The number of Vernier divisions of the instrument is 20 and the length of one smallest division of main scale is 1 mm.

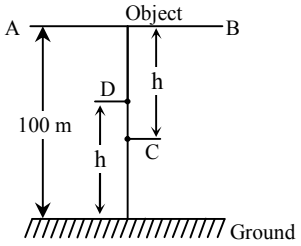
Scenario-2 : The informations related with a moving car is given in the following table:

Time (second)	0	12	24	36	48	60
Distance (meter)	0	6	12	18	24	30

a. What is called Vernier constant? 1
b. Moving object has distance travelled but may not have displacement.—Explain. 2
c. Find out the Vernier super-imposition in the light of scenario-1. 3
d. Draw the distance—time graph according to scenario-2 and does the obtained graph make an angle 45° with X-axis? Put your opinion through analysis. 4

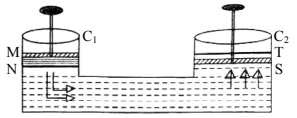
2. ▶ Scenario-1 : An object is thrown vertically upward with a velocity 2Q ms^{-1}. Acceleration due to gravity of the place is 9.8ms^{-2}.

Scenario-2:



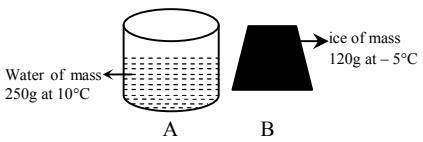
The mass of the object in figure is 50g. And the object is allowed to fall freely. At C kinetic energy will be doubled of potential energy.
a. What is called fluid friction? 1
b. Why is the bottom surface of shoe designed with grooves? 2
c. How much time will the object take to reach the maximum height in scenario-1? 3
d. In case of scenario-2 the total energy of the body at point C and D remains same. Give your opinion through analysis. 4

3. ▶



In figure the radii of the cylinders C_1 and C_2 are 3cm and 6 cm respectively. If 1000 N force is applied on the piston of C_1, it is moved from M to N at distance 6 cm. As a result the piston of C_2 is moved 1 cm from position S to T.
a. What is called pressure? 1
b. Explain why the unit of stress is same as the unit of modulus of elasticity. 2
c. Find out the experienced force on the piston of cylinder C_2. 3
d. Energy is not increased in the event of the above stem. Express your opinion through analysis. 4

4. ▶



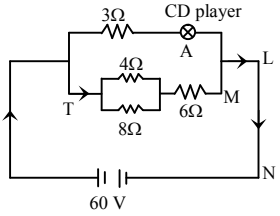
Specific heat of water is 4200 $Jkg^{-1}K^{-1}$, Specific heat of ice is 2100 $Jkg^{-1}K^{-1}$, Latent heat of fusion of ice is 3,36,000 Jkg^{-1}.
a. What is called heat capacity? 1
b. Explain why temperature of a fevering body is decreased when a band of wet cloth is used. 2
c. Find out the temperature of the piece of ice in Fahrenheit scale. 3
d. If the object B is released in the liquid of container, A what will be the final state of the mixture? Put your opinion with mathematical analysis. 4

5. ▶ Scenario-1 : The velocity of sound in a place is 350 ms^{-1} and its wavelength is 0.7m.

Scenario-2 : The length of a tube made of iron is 513m. It is filled with water. Velocity of sound in water and iron are 1440 ms^{-1} and 5130ms^{-1} respectively.
a. What is called echo? 1
b. The motion of vibrating arm of tuning fork is vibratory motion—Explain it. 2
c. Determine the time period in the light of scenario-1. 3
d. If one end of the tube in scenario-2 is struck once, sound is heard at another end of the tube more than one time, why? Analyse it with reasons. 4

6. ▶ In a spherical mirror the linear magnification of an extended object is greater than 1. The focal length of the mirror is 10 cm. An object is placed at a distance 15 cm away in front of the mirror.
a. What is called optical center? 1
b. Why is convex lens called converging lens? 2
c. Find out the image distance of the object of the stem. 3
d. If an extended object is placed at a distance 5cm away from the mirror, what will be the position, size and nature of the image? Analyze it with the help of ray diagram. 4

7. ▶



The power of CD player, A is 1.2 kW and the power of another CD player, B is 2 kW.
a. What is called electric induction? 1
b. Why is an object charged by friction? 2
c. Find out the equivalent resistance of the part between T and M of the circuit. 3
d. CD player A runs in the circuit. If B is connected between L and N without using A, it will not run, why? Analyze the reasons with logic. 4

8. ▶

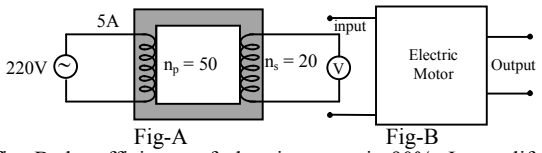


Fig-A Fig-B

In fig. B the efficiency of electric motor is 90%. It can lift the amount of water 200 kg in 40 seconds in a tank placed at a height 40m. [g = 9.8 ms^{-2}]
a. What is called generator? 1
b. Why does semiconductor behave as insulator at low temperature? 2
c. Determine electric current in secondary coil of the device A of the stem. 3
d. Is it possible to run the device B with the help of device A? Analyze it. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Whcih work the rectifier will do?
a To increase electric current
b To decrease electric current
c To increase potential difference
d To make the electric current unidirectional

2. Pressure is a —
i. derived quantiry
ii. vector quantity iii. Scalar quantity
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

3. At which temperature the Celsius and Fahrenheit scale is same?
a – 80°C b –40°C
c 40°C d 80°C

Answer the question no. 4 and 5 in the light of stem below:
With a screw gauge of pitch of 0.5mm and least count of 0.01mm the diameter of a wire has got 7.28mm.

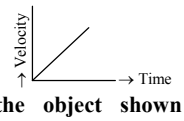
4. What is the numebr of division of circular scale?
a 100 b 50
c 20 d 10

5. To measure the diameter of the wire —
i. circular scale needs to rotate 7 times
ii. circular scale needs to rotate 14 times
iii. the rotated number of division of circular scale is 728
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. Which test is done during exercise?
a Radiotherapy b ETT
c Angiography d MRI

7. If we divide the unit of heat by the unit of mass, then the unit of which quantiry can we get?
a Pressure
b Specific latent heat
c Sepcific heat d Heat capacity

8.



How the object shown in above figure moves with?
a Uniform acceleration
b Non-uniform acceleration
c Uniform velocity
d Negative acceleration

9. What type of friction is the friction between the wheel of cycle and the road?
a Static friction b Sliding friction
c Rolling friction d Fluid friction

10. Periodic motion is —
i. the motion of simple pendulum
ii. the motion of the cylinder of petrol engine
iii. the motion of vibrating tuning fork
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Read the following stem and answer the questions nos. 11 and 12:
The focal length of a convex lens is 20cm. In front of that lens an object of 2m height is placed on the principal axis at a distance of 40cm. As a result an image is formed at the opposite side of the lens.

11. What is the height of the stimulate image?
a 2m b 4m
c 6m d 10m

12. The nature of the image is —
i. real and inverted
ii. virtual and inverted
iii. real and same size
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

13. What will be the induced current if the turns of coil is increased?
a Zero
b Current will reduce
c Remain constant
d Current will increase

14. How much Fahrenheit is equal to 40°C?
a 40°F b 72°F
c 104°F d 313°F

15. Which one is correct for the transformation of energy in case of hearing the speech over telephone?
a Electrical energy to sound energy
b Heat energy to electrical energy
c Magnetic energy to sound energy
d Sound energy to magnetic energy

16. How is the potential energy of anybody at a particular height?
a Proportional to the velocity of the body
b Proportional to the square of the mass
c Inversely proportional to the mass
d Proportional to the mass

17. What will be the change of momentum, if the velocity of a body will double?
a Remain unchanged
b Will be half
c Will be four times
d Will be double

18. The half life of any radioactive element is 100 years. How much time will required to remain unchanged $\frac{1}{8}$ th part of that element?
a 50 years
b 100 years
c 200 years d 300 years

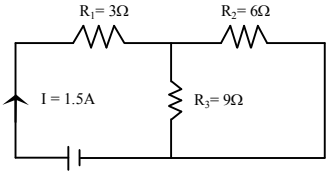
19. What is the diameter of the body which mass is considered as one kilogram?
a 9.3cm b 3.6cm
c 6.3cm d 3.9cm

20. Which one is changed by latent heat?
a Temperature b State
c Melting point d Boiling point

21. What is the speed of sound in vacuum?
a $1008ms^{-1}$ b $354ms^{-1}$
c $348ms^{-1}$ d $0ms^{-1}$

22. Which one is the dimension of frequency?
a T b f
c T^{-1} d f^{-1}

Answer the question no. 23 and 24 in the light of above stem:



23. What is the equivalent resistance of the circuit?
a 4.5Ω b 6.6Ω
c 8.2Ω d 18Ω

24. How much unit of electricity will be used in one month if the circuit is on for 12 hours per day?
a 14.58 unit b 6.642 unit
c 5.346 unit d 3.645 unit

25. It the magnification of an object is less than 1, then the mirror is —
i. plane ii. convex
iii. concave
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Ans.																											
	1	d	2	b	3	b	4	b	5	c	6	b	7	b	8	a	9	c	10	d	11	a	12	c	13	d	
	14	c	15	a	16	d	17	d	18	d	19	d	20	b	21	d	22	c	23	b	24	c	25	c			

30. Rajshahi Board-2020

Physics Subject Code: | 1 | 3 | 6 |

Time — 2 hours 35 minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The following table shows the magnitude of velocity of a moving car for different time intervals :

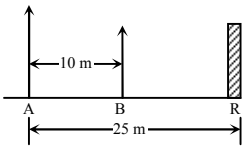
Velocity (ms^{-1})	2	4	6	6	7	8
Time (s)	0	5	10	15	20	25

a. What is called periodic motion? 1
b. "Oscillatory motion is a periodic motion"— Explain. 2
c. Calculate the distance covered by the car in 15th second. 3
d. Draw and analyze the "Velocity-Time" graph of the car. 4

2. ▶ A drop of water of 1 mg fall on the ground with a velocity of 15 ms^{-1} from 20m above from the ground against air resistance [$g = 9.8\ m/s^2$].
a. What is called Vernier constant? 1
b. Why it is difficult to climb up to the mountain than coming down? Explain it. 2
c. Determine the time to fall the drop of water to the ground. 3
d. "The weight of the drop of water is more than the resistive force of air"— Explain mathematically. 4

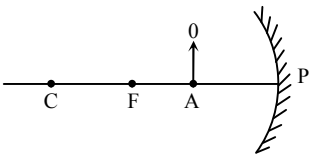
3. ▶ If the temperature of a metallic sphere of radius 1 cm will increase by 50°C then its volume becomes 4.1993 cm^3 and surface area becomes 12.5874 cm^2.
a. What is called melting point? 1
b. Why is air of fan felt cold in the wet body? Explain. 2
c. Calculate the increased temperature of the sphere in Fahrenheit scale. 3
d. From the stem establish a relation between the co-efficient of volume expansion and the co-efficient of area expansion. 4

4. ▶



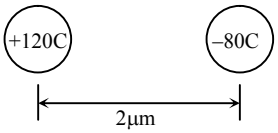
In the above figure 'A', 'B' and 'R' represent position of source of sound, observer and reflector respectively. Here the sound takes 0.143 second time to come at source 'A' after being reflected from 'R' [Speed of sound at 0°C is 330 ms^{-1}]
a. What is called pitch of sound? 1
b. Why is the speed of sound vary in air medium? Explain it. 2
c. Calculate the temperature of air in the mentioned place. 3
d. Does the listener of position 'B' hear an echo when sound is produced from source 'A'? Analyze mathematically. 4

5. ▶



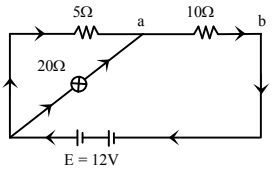
In the above figure the radius of curvature of the mirror is 10 m. A is the midpoint of PF and its linear magnification of the image is "-2".
a. What is called refraction of light? 1
b. Without touching how you can detect a lens? Explain. 2
c. Determine the position of the image mathematically. 3
d. According to the stem give a brief discussion of the formation of image with ray diagram. 4

6. ▶



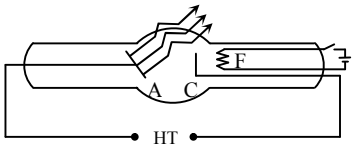
a. Define capacitor. 1
b. Why plastic will negatively charged if a woollen cloth is rubbed with it? Explain. 2
c. Calculate the force between two charged particles in the stem. 3
d. At which point on the joining line of two charge, the electric intensity will be zero? Analyze mathematically. 4

7. ▶



a. What is equivalent resistance? 1
b. "The specific resistance of copper is 1.68×10^{-8} Ωm" does it mean? Explain. 2
c. Calculate the amount of current passes through the bulb. 3
d. Do you think if the 2nd end of the bulb is connected with 'b' point instead of 'a' point, then the bulb will glow brightly? Analyze it mathematically according to your opinion. 4

8. ▶



The wavelength and velocity of the produced ray in the stem are 10^{-10} m and 3×10^8 m/s respectively.
a. Define Radioactivity. 1
b. Write down the two significance of ultrasonography. 2
c. Determine the frequency of the produced ray in the stem. 3
d. Analyze the technique of produced ray in the stem. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Who explained the idea of heliocentric solar system?
a Copernicus b Thales
c Aryabhatta d Rutherford

2. Which of the following is vector quantity?
a Work b Buoyancy
c Pressure d Speed

3. If an object is dropped from 100 m height, with what velocity will it hit the ground?
a $22.14 ms^{-1}$ b $31.30 ms^{-1}$
c $44.27 ms^{-1}$ d $69.29 ms^{-1}$

4. Which of the following is used by dentists?
a Concave mirror b Convex mirror
c Convex lens d Concave lens

5. The electric force between two charges —
i. depends on the nature of the charges
ii. if each of the charges is multiplied by 2, the electric force will be multiplied by 8
iii. if the distance between the charges is halved, the electric force will be multiplied by 4
Which one of the following is correct?
a i b iii
c i and ii d i and iii

6. Which is not the nature of musical sound?
a Intensity b Phase
c Timbre d Pitch

7. If a tennis ball of 50g mass is thrown at $20 ms^{-1}$ velocity and it hits a wall and bounces back, what will be the change of momentum?
a $0 kgms^{-1}$ b $1 kgms^{-1}$
c $2 kgms^{-1}$ d $20 kgms^{-1}$

8. Which is the dimension of power?
a ML^2T^{-2} b ML^2T^{-3}
c MLT^{-2} d $ML^{-1}T^{-2}$

9. Which has more sliding friction?
a Truck b Motor cycle
c Bicycle d Private car

10. Which is the density of iron?
a 7.80gm/cc
b 13.69gm/cc
c 19.30gm/cc
d 2.60gm/cc

Read the following stem and answer to the questions no. 11 and 12:
An iron rod with 75°C temperature is immersed in 150g of water with 30°C temperature, resulting in the final temperature of 56°C. The specific heat of water is $4200 Jkg^{-1}K^{-1}$ and the specific heat and density of iron are $450 Jkg^{-1}K^{-1}$ and $7800 kgm^{-3}$ respectively.

11. What is the heat absorbed by water?
a 16380J b 18900J
c 35280J d 16380000J

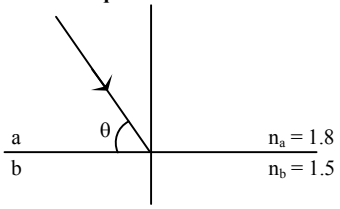
12. In the event —
i. heat given up by iron rod = heat absorbed by water
ii. mass of iron = 9 × mass of water
iii. heat capacity of water < heat capacity or iron rod
Which one of the following is correct?
a ii b iii
c i and iii d i, ii and iii

13. Which of the following is the unit of the modulus of elasticity?
a $kgm^{-1}s^{-2}$ b kgm^2s^{-2}
c $kgms^{-2}$ d kgm^2s^{-3}

14. Which of the following is chargeless and massless particle?
a Alpha b Beta
c Gama d Positron

15. If an object is put at a distance, which is twice the focal length, its image will be —
i. in the center of curvature
ii. inverted
iii. same size of the object
Which one of the following is correct?
a i b i and iii
c ii and iii d i, ii and iii

Carefully study the following stem and then answer to the questions no. 16 and 17:



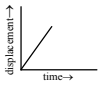
16. What is the refractive index of medium 'b' with relation to medium 'a'?
a 0.3 b 0.83
c 1.2 d 3.95

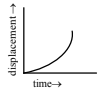
17. In that event —
i. $C_a < C_b$
ii. angle of incidence > angle of refraction
iii. if θ = 33.56°, the ray of light will bend toward the surface of separation
Which one of the following is correct?
a i b iii
c i and ii d i and iii

18. The incidnet of generating electric current in a circuit by changing magnetic field is called —
a electric induction
b electromagnetic induction
c magnetic induction
d magnetic intensity

19. Which of the following is the graph for uniform acceleration?

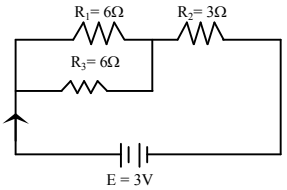
a 

b 

c 

d 

Carefully observe the stem and answer to the questions no. 20 and 21:



20. What is the equivalent resistance of the circuit?
a $15\ \Omega$ b $\frac{18}{5}\Omega$
c $\frac{12}{5}\Omega$ d $6\ \Omega$

21. In the circuit —
i. electric current is same in R_1 and R_2
ii. power of R_2 and R_3 is not same
iii. potential difference between R_1, R_2 and R_3 is same
Which one of the following is correct?
a i b ii
c i and ii d i, ii and iii

22. If the amplitude of sound waves increases by 3 times, how much the intensity of sound will increase?
a $\frac{1}{9}$ times b $\frac{1}{3}$ times
c 3 times d 9 times

23. Which of the following is made following the functions of a generatior?
a Speaker
b Microphone
c Motor
d Radio

24. Which substance's conductivity increases if its temperature increases?
a Copper b Iron
c Zinc d Silicon

25. Which of the following experiments uses dye?
a CT scan
b MRI
c Ultrasonography
d Angiograp

Ans.	1	a	2	b	3	c	4	a	5	d	6	b	7	c	8	b	9	a	10	a	11	a	12	c	13	a
	14	c	15	d	16	b	17	d	18	b	19	c	20	d	21	d	22	d	23	b	24	d	25	d		

31. Dinajpur Board-2020

Physics

Subject Code: | 1 | 3 | 6 |

Time — 2 hours 35 minutes

Creative Essay Type Questions

Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ An object 'A' of mass 500gm drop from a roof of a building of height 196m. At the same time another object 'B' of mass 200gm thrown directly upward with a velocity $30ms^{-1}$.

a. Define displacement? 1
b. The kinetic energy is never negative — Explain. 2
c. At which height from the ground the potential energy and the kinetic energy of object 'A' will be same? 3
d. The total energy of object 'B' will be unchanged at the moment of throwing and at after 2 seconds of throwing — Explain with mathematical logic. 4

2. ▶

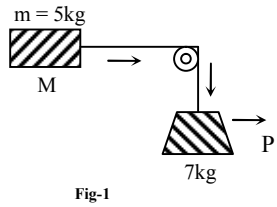


Fig-1

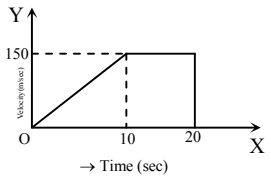


Fig-2 : Velocity time graph of a moving car

a. Define rolling friction. 1
b. When an object is falling from a steady state, the velocity of the object is changing— Why? 2
c. According to fig-2 calculate the distance of the car by 20 seconds. 3
d. According to fig-1 analyze the force of the object 'P' on the object 'M'. 4

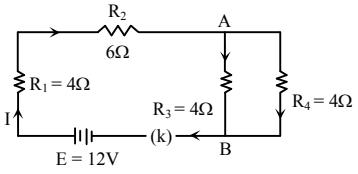
3. ▶ At 20°C temperature a piece of steel has area $200cm^2$. When the temperature is increased to 120°C its area became $200.668cm^2$.

a. Define specific heat? 1
b. Why is cooking done faster in a pressure cooker? 2
c. Calculate the co-efficient of volume expansion of the steel. 3
d. If the heated steel is putted in water of 40°C placed in a aluminium pot, what will happen? Analyze with the help of "Fundamental principle of calorimetry". 4

4. ▶ In a hydraulic press the ration of diameters of larger and smaller piston is 5:1. If the smaller piston travels some distance, the larger piston gains a force of 300N.

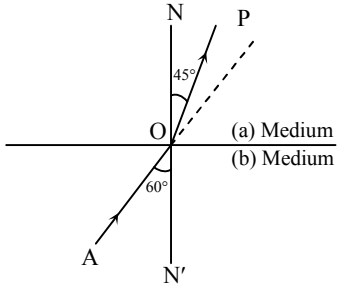
a. What is buoyancy? 1
b. Why it is easy to make a hole with a sharp pin in a paper. 2
c. Find the applied force on the smaller piston. 3
d. According to the stem, the works done are same of the two pistons — Analyze with the help of "Principle of multiplication of force." 4

5. ▶



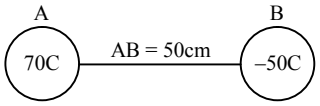
a. State Ohm's law? 1
b. Why the conductivity of the semiconductors are increased by increasing the temperature? 2
c. Calculate the power of resistance R_2. 3
d. Draw a circuit diagram for residence by using electronic equipments of the substitute resistances which are used in the above circuit in the stem. Explain the necessity of a fuse used in the drawn circuit diagram. 4

6. ▶



a. Define refractive index. 1
b. Why a piece of diamond is brighter than a piece of glass? 2
c. Find the relative refractive index of medium (b). 3
d. If this two medium exchange their place and AO light goes in same direction then what will happen? Analyze with figure. 4

7. ▶



a. Define electric field? 1
b. Why a metal chain hangs from the fuel tank? Explain. 2
c. Calculate the neutral point in between the connecting line of the two charges? 3
d. By which charge, a neutral body will turn into a positive charged body? Explain with figure. 4

8. ▶ On the way of office Mr. Mirza slipped suddenly and felt too much pain in his leg. When he was taken top hospital Doctor suggest him to take a test in his leg where a special ray is used. By observing his test report that there is a crack in his bone.

a. Define radioactivity. 1
b. Why dye is used in angiography? 2
c. Describe the procedure of production of the ray with a figure in the stem. 3
d. How the ray of the stem is used in cancer treatment? Explain in details. 4

Time — 25 minutes

Creative Multiple Choice Questions

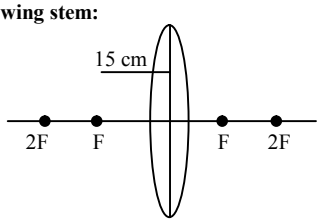
Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which one of the following used electro-magnetic radio frequecy in human body?
a X-ray b Ultrasonography
c CT scan d MRI

2. For the uses of analog signals —
i. increasing noice
ii. magnify signal
iii. possibility to lost signal
Which one is correct?
a i and ii b ii and iii
c i and iii d iii

Answer the questions no. 3 and 4 from the following stem:

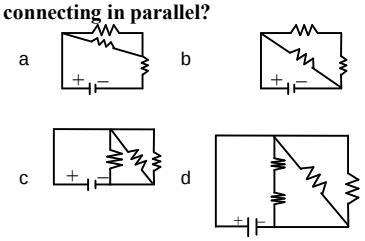


3. What is the power of the lens?
a +6.66 D b – 6.66 D
c + 0.06 D d – 0.06 D

4. If the object located 20 cm away from the optical center then —
i. nature is real and inverted
ii. small in size
iii. image distance is 60 cm
Which one is correct?
a iii b i and ii
c ii and iii d i and iii

5. What type of transformation happened in microphone?
a Electric energy → Sound energy
b Sound energy → Mechanical energy
c Mechanical energy → Sound energy
d Sound energy → Electric energy

6. Which one of the following figure shows that three resistances are connecting in parallel?



7. Where in Bangladesh will a nuclear power plant be built?
a Sundarbans b Rampal
c Ruppur d Vijoyanagar

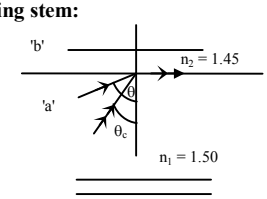
8. What is the name of the motion of an object hanging from a spring?
a Periodic motion
b Simple harmonic motion
c Translational motion
d Linear motion

9. When a stone tied with a string and moving around the head then the stone —
i. change the direction constantly
ii. gets acceleration
iii. moving with uniform velocity
Which one is correct?
a i and ii
b ii and iii
c i and iii
d i, ii and iii

10. Which one is the dimention of the power?
a ML^2T^{-3} b MLT^{-2}
c $ML^{-1}T^{-2}$ d ML^2T^{-2}

11. Which Newton's law helps to measure force?
a Gravitational force
b Newton's first law
c Newton's Second law
d Newton's third law

Answer the question no. 12 and 13 from the following stem:



12. What is the incident angle of the figure?
a 60° b 70°
c 72° d 75°

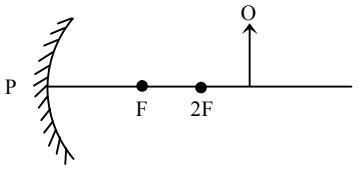
13. For the total internal reflection from the figure is —
i. $\theta > \theta_c$
ii. $n_1 > n_2$
iii. light incedent in 'b' medium
Which one is correct?
a i b ii
c i and ii d ii and iii

14. Which type of wave create the feeling of hearing?
a Electromagnetic wave
b Mechanical wave
c Radio wave
d Light wave

15. What is the duration of sensation of hearing sound?
a 0.03 sec b 0.01 sec
c 0.1 sec d 0.3 sec

16. Which one of the following used in the high telescope?
a Convex mirror
b Concave mirror
c Plane mirror
d Convex lens

17. What is the location of the image from the figure?



a At principal focus
b At center of curvature
c In between principal focus and center of curvature
d In between pole and principal focus

18. What is the unit of power of the lens?
a Watt b Horse power
c Kilowatt-hour d Diapter

19. What is the value of force when 10 C charge put at any point the field of electric intensity 1 N/C?
a 0.1 N b 10 N
c 1 N d 20 N

20. What is the reason for seeing object in different distance with the help of eyes?
a Change of aqueous humour
b Change of lens focus distance
c Change the shape of the retina
d Change the distance in between retina and lens

21. If the equivalent resistance value is 5.33 then how to arrange the resistances when $R_1 = R_2 = R_3 = R_4 = 4\Omega$?
a When four resistances connect in parallely
b When connect two parallel and two series
c When connect three parallel and one series
d When connect three series and one parallel

22. Which one of the following unit for conductivity?
a $(\Omega m)^{-1}$ b m
c Ω d Ωm

23. What is the nature of motion path of alpha particle in the air?
a Spiral b Linear
c Zigzag d Circular

24. Which one is formed when the change of magnetic field inside the conducting coil?
a Electric motor
b Transformer
c Electric generator
d Transistor

25. The number of turns in the primary coil of a transformer is 18 and the number of turns in the secondary coil is 90. The current flow in the secondary coil is 0.5A. What is the current flow in the primary coil?
a 0.1A b 0.5A
c 2A d 2.5A

Ans.																									
	1	d	2	c	3	a	4	d	5	d	6	c	7	c	8	b	9	a	10	a	11	c	12	d	13	c
	14	b	15	c	16	b	17	c	18	d	19	b	20	b	21	c	22	a	23	b	24	c	25	d		

32. Cumilla Board-2020

Physics Subject Code: 1 3 6

Time — 2 hours 35 minutes **Creative Essay Type Questions** Full marks — 50

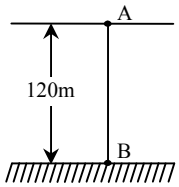
[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ A list of velocity and time of a car is given below:

Time (s)	0	2	4	6	8	10	12	14
Velocity v(ms^{-1})	0	5	12	12	12	8	4	2

a. What is called momentum? 1
b. Why it is difficult to walk on sand? 2
c. Determine the distance covered by the car in first 8 sec. 3
d. Draw the velocity vs time graph from the above list and analyze the change of its velocities. 4

2. ▶



In the figure a body 'A' is falling from a height of 120m. At the same time, another body 'B' is thrown vertically upward with a velocity 19.6 ms^{-1}.

a. Define potential energy. 1
b. In all respect why equal work cannot be done by applying equal force? Explain. 2
c. Determine the velocity of the body 'A' after 3s. 3
d. Except ground, will these bodies meet at any point? State your opinion with mathematical analysis. 4

3. ▶ 100 m long iron plate is used as rail line. There is 4 cm gap in between two plates. Increase of temperature is 20°C. The co-efficient of linear expansion is $1.15\times10^{-5}K^{-1}$.

a. What is called specific heat? 1
b. What type of work will be done for the falling of mango from tree? Explain. 2
c. Determine the expansion of length of iron plate. 3
d. What will be the condition of rail line if increase of temperature is 40°C? Explain. 4

4. ▶

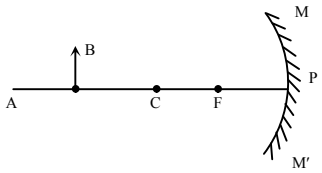
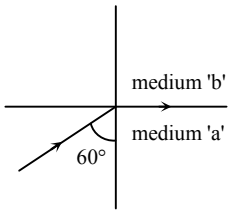


Figure-X

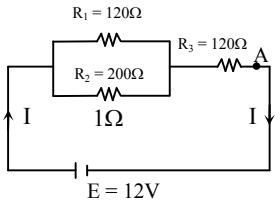
a. What is the focus of a mirror? 1
b. Why a definite distance is required to hear the echo? 2
c. How will be the image of given object? Describe with figure. 3
d. Is it possible to form a virtual image in the stimulated mirror? Explain your opinion with ray diagram. 4

5. ▶



a. What is prism? 1
b. Why the plane mirrors big in size are placed at 45° at the turns of hilly road? 2
c. Determine the refractive index of medium 'a' with respect to the medium 'b'. 3
d. The density of which medium is greater between 'b' and 'c', if the critical angle becomes half by using the medium 'c' instead of medium 'b'? Analyze mathematically. 4

6. ▶



a. What is radioactivity? 1
b. The images formed by the CT scan and X-Ray are not same— Explain. 2
c. Calculate the current at point 'A' of the given circuit. 3
d. By disconnecting which resistance, the electric current of the circuit will be maximum? Give opinion with mathematical analysis. 4

7. ▶ The voltage of the primary coil and the secondary coil of a transformer are 20V and 50V respectively. The number of turns of the primary coil of that transformer is 100.

a. What is friction? 1
b. How mirror is identified without touch? 2
c. Determine the ratio of the electric current of the secondary coil and the primary coil of the transformer. 3
d. What change should be done of the turns of coil to make the transformer suitable for residence? Analyze mathematically. 4

8. ▶ A student of class ten Samrat has gone to Ruppur of Pabna for study tour. He observed the mechanism of energy production in nuclear reactor there.

a. What is fax? 1
b. What is meant by the half-life of radioactive element? 2
c. How energy is produced in the place seen by Samrat? Describe. 3
d. How much logical the mechanism of the production of that energy in Bangladesh? What do you think about it. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

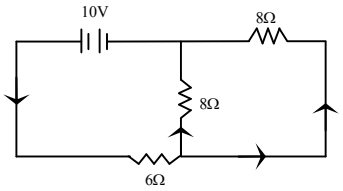
1. Which of the following becomes active in strong light?
a Eye lens b Cornea
c Cones d Rods

2. The stars revolve in the galaxy because of which force?
a Strong nuclear force
b Weak nuclear force
c Electromagnetic force
d Gravitational force

3. If the time period of a wave transmitting particle increases, what change it will cause to the frequency? It will —
a decrease b incrase
c be nill
d remain unchanged

4. If the power of the lens is postive —
i. its focal length will be positive
ii. the lens can create both real and virtual images
iii. the lens will be remedy for myopia
Which of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

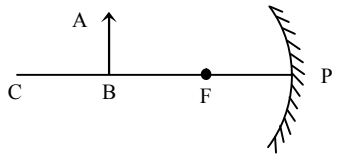
5.



What is the current of the circuit?
a 1.00A b 1.88A
c 2.5A d 10.00A

6. Through which of the following can electron flow freely?
a Glass b Silicon
c Aluminium d Germanium

7.

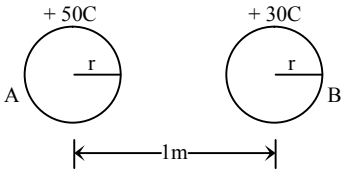


Which of the following is right in case of the image of the object AB?
a Inverted b Virtual
c Smaller d Infinity

8. What is the unit of the modulus of elasticity?
a W^5 b Nm^{-2}
c Js^{-1} d $kg\ m^{-3}$

9. 1500N force is applied to a stationary object with 10kg mass for 0.15 time. Whatj will be the change of the object's momentum?
a 100 kg ms^{-1} b 225 kg ms^{-1}
c 10000 kg ms^{-1} d 15000 kg ms^{-1}

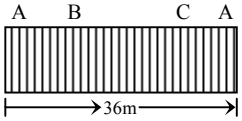
10.



If two spheres are connected by a piece of wire with current conduction capacity —
i. electron will flow from B to A
ii. the change of force will be 9×10^{11}N
iii. potential of A will decrease
Which of the following is correct?
a i b i and ii
c ii and iii d i, ii and iii

11. Which of the following is correct in case of an image created on a convex mirror?
a Real and inverted b Very magnified
c Equal to the object
d Within the focus

Answer to the question no. 12 and 13 in light of the following information:



The wave takes 0.1s time to reach point D from point A.

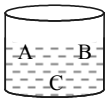
12. Which of the following is correct?
a It is transverse wave
b Its wavelength is 36m
c Its wavelength is three times λ
d The points B and C are in same phase

13. What is the frequency of the wave?
a 10 Hz b 27.5 Hz
c 27.66 Hz d 30 Hz

14. Which of the experiments uses Tomography?
a CT. Scan b ECG
c MRI d Angiography

15. Which of the following does not have free electrons?
a p-type semiconductor
b n-type semiconductor
c n-p-n transistor d p-n-p transistor

16.



Three objects of same volume put into a jar of liquid are shown in the picture. Object A is 60% immersed in the liquid. Density of object A is 600K gm^3.
In case of the objects in the picture —
i. Mass of object A > mass of liquid displaced by object A
ii. lost weight of objects B and C is equal
iii. density of object B is 1000 Kgm^{-3}
Which of the following is correct?
a i b ii
c ii and iii d i, ii and iii

17. Which one is correct in case of a step up transformer?
a $V_p > V_s$ b $n_s > n_p$
c $I_p < I_s$ d $P_p > P_s$

18. Who has discovered magnetic field in the flow of electricity?
a Einstein b Oersted
c Faraday d Max Plank

19. How many meters equal one picometer?
a 10^{-9} b 10^{-12}
c 10^{-15} d 10^{-18}

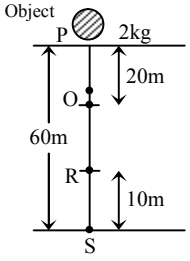
20. Which of the following can determine the nature of charge?
a Ammeter b Galvanometer
c Electroscope d Voltmeter

21. Which of the equations is right?
a $S = \frac{v^2 - u^2}{2a}$ b $ut = s + \frac{1}{2}at^2$
c $t = \frac{v + u}{a}$ d $t = \left(\frac{u + v}{2}\right)s$

22. Which of the following substance's melting point goes down under pressure?
a Brass b Cast iron
c Wax d Ice

23. The velocity of an object is 20ms–1 after 5 seconds of its start from rest. How much distance it will travel in next 10 seconds?
a 400 m b 220 m
c 200 m d 150 m

Answer to question no. 24 and 25 by using the following information:



24. What is the potential energy of the object in position P?
a 588J b 784J
c 980J d 1176J

25. In case of the figure —
i. at Q point, kinetic energy – potential energy = 0
ii. potential energy at P point = 6 × poetntial energy at R point
iii. change of kinetic energy at PR<change of kinetic energy at RS
Which one is correct?
a i b ii
c ii and iii d i, ii and iii

Ans.																											
	1	c	2	d	3	a	4	a	5	a	6	c	7	a	8	b	9	b	10	d	11	d	12	c	13	d
	14	a	15	a	16	c	17	b	18	b	19	b	20	c	21	a	22	d	23	a	24	d	25	b		

33. Chattogram Board-2020

Physics

Subject Code: | 1 | 3 | 6 |

Time — 2 hours 35 minutes

Creative Essay Type Questions

Full marks — 50

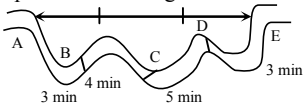
[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The travelling time and distances of a car are given below:

Time(s)	Distance(m)
0	0
2	6
4	24
6	54
8	96
10	150

Information-1

A running cycle's path and time is given below:



AB = BC = CD = DE = 1km and AE = 3 km.

Information–2

a. State the third law of falling bodies. 1
b. Why the motion of a vibrating tuning fork is called harmonic motion? 2
c. Determine the difference of the average speed and average velocity of the cycle from the information-2. 3
d. Draw a velocity vs time graph from the given information-1, and analyze their nature. 4

2. ▶

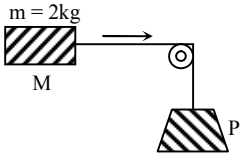


Fig-1: A weight is hanging of M object

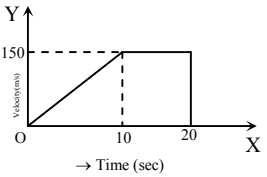


Fig-2: Velocity-time graph of a car

a. Define balance force. 1
b. Why walking is difficult in a muddy street? 2
c. Calculate the distance of the car by 20 seconds according to fig-2. 3
d. According to fig-1 analyze the force of the object P on the object M. 4

3. ▶ **Scene-1:** A man of power 558W threw a cricket ball of mass 300g to the upward direction with a velocity 40m/s.

Scene-2: If an object of mass 100kg is lifted 20m height in 20s by using a motor of 2KW.

a. Define biomoss energy. 1
b. Explain the relation between momentum and kinetic energy. 2
c. At what height the potential and kinetic energy of the ball will be same? Calculate it by scence-1. 3
d. According to scene-2 explain the amount and the process of the lost energy by calculating the efficient of the motor. 4

4. ▶

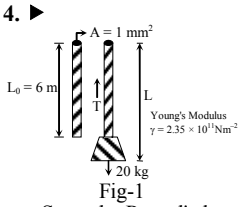


Fig-1

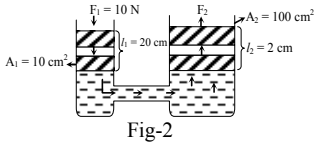
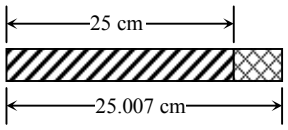


Fig-2

a. State the Pascal's law. 1
b. Why the unit of stress and Young's modulus are same? Explain. 2
c. Calculate the increase in length of the bar? 3
d. Whether the works of the two pistons are same or not? Explain in view of Fig-2. 4

5. ▶



$T_1 = 20°C \longrightarrow T_2 = 50°C$

Fig-1

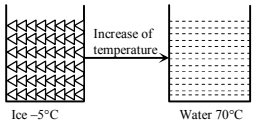
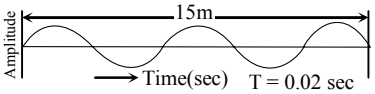


Fig-2

Specific heat of water is 4200 $Jkg^{-1}K^{-1}$.
Latent heat of ice is 334 kJ/kg.

a. Define heat capacity? 1
b. Why there is no difference between apparent expansion and real expansion of vapour? Explain. 2
c. Calculate the co-efficient of linear expansion of the bar. 3
d. According to fig-2 draw a "Temperature *Vs* time" graph and explain its different parts. 4

6. ▶



a. Define intensity of sound. 1
b. Why all reflected sound is not echo? Explain. 2
c. Calculate the velocity of the wave. 3
d. Explain by drawing a figure, how the above wave will propagate in air medium. 4

7. ▶

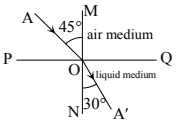


Fig- 1

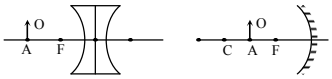


Fig- 2

a. Define magnification. 1
b. Why leaves look black in red light. 2
c. According to fig-1 determine the velocity of light in the liquid medium. 3
d. According to fig-2, for mirror and lense which image of object OA will be projected on a screen? Explain by drawing a ray diagram. 4

8. ▶

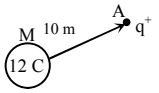


Fig-1

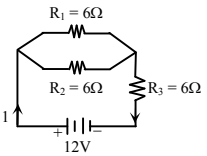


Fig-2

a. Define electric power. 1
b. Why the conductivity of a conductor is decreased by increasing temperature? 2
c. Calculate the electric field of object M at point A in figure-1. 3
d. Are the current following through all resistances same of figure-2? Give your opinion. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Who showed that all galaxies of the Universe are moving away from one another?
a Dirac b Hubble
c Becqurel d Roentgen

2. The motion of an oscillatory baby on a swing is —
a circular motion
b translation motion
c periodic motion
d simple harmonic motion

3. Which one of the following is a source of non-renewable energy?
a Nuclear energy b Biomass
c Solar energy d Wind energy

4. The normal temperature of a human body is —
a 98.4 k b 98.4°C
c 36.89°C d 36.89°F

5. Which musical instrument is based on air flow?
a Violin b Dhol
c Tabla d Harmonium

6. Velocity of light in water is —
a $1.24 \times 10^8 ms^{-1}$ b $2 \times 10^8 ms^{-1}$
c $2.26 \times 10^8 ms^{-1}$ d $3 \times 10^8 ms^{-1}$

7. Dimension of force is —
a MLT^{-2} b MLT^{-1}
c ML^2T^{-3} d ML^2T^{-2}

8. Which of the following machines is used X-ray?
a Ultrasonography b CT scan
c Endoscopy d ECG

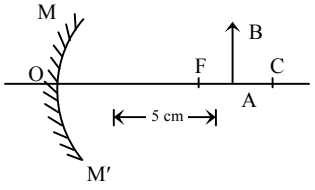
9. Which of the following is Insulator?
a Aluminum b Silicon
c Rubber d Germanium

10. What is the charge of an electron?
a $-1.6 \times 10^{-19}C$ b $-9 \times 10^9 C$
c $1.6 \times 10^{-19}C$ d $9 \times 10^9 C$

11. If the mass is the same, which of the following substances will be larger in volume?
a Wood b Glass
c Water d Mercury

12. Which is the smallest unit?
a Micrometer b Nanometer
c Picometer d Femtometer

By which the following figure and information, answer the questions 13 and 14:

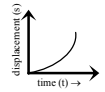


The object AB is placed in the middle of within the principal focus and the center of curvature.

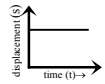
13. How far from the pole of mirror will the image be formed?
a – 10 cm b 7.5 cm
c 30 cm d 60 cm

14. If AB moves about 10 cm towards the mirror will create —
i. a virtual image
ii. double sized image of the target
iii. an inverted image
Which is correct?
a i b ii
c i and ii d i, ii and iii

15. Which are represents the graph of an uniform acceleration from following displacement (s) time (t) graph?

a 

b 

c 

d 

16. If the number of turns of the primary coil of a transformer is higher than the number of turns of the secondary coil —
i. it is a step-down transformer
ii. its primary current is less than the secondary current
iii. then its primary voltage is higher than the secondary voltage
Which is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

17. A boy pushes a box of 2×10^4g onto a fricitonless floor by 50n force. What is the acceleration of the box?
a 400 ms^{-2} b 2.5 ms^{-2}
c 0.4 ms^{-2} d 0.0025 ms^{-2}

$$A_n \rightarrow B_{n-4} + He_4$$

A and B are two radioactive elements whose halflife are 100 years and 200 years respectively.

From the information, answer the questions number 18 and 19:

18. After 400 years —
a element A and B are left 6.25% and 25% respectively
b element A and B are left 25% and 6.25% respectively
c element A and B are left 12.5% and 25% respectively
d element A and B are left 25% and 12.5% respectively

19. Particles emitted in the transaction from A to B is —
i. a helium nucleus
ii. charged $+ 3.2 \times 10^{-19}C$
iii. ionized the air
Which is correct?
a i b ii
c i and ii d i, ii and iii

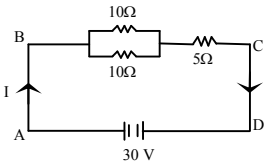
20. An object of mass 500 kg is moving at $20ms^{-1}$. If the object creates $0.5ms^{-2}$ decleration for 10s, its kinetic energy will —
a $5.625 \times 10^4 J$
b $1 \times 10^5 J$
c $1.125 \times 10^5 J$ d $1.5625 \times 10^5 J$

21. How many times does the amplitude of a sound wave increase, its energy increases by 9 times?
a 81 times b 3 times
c $\frac{1}{9}$ times d $\frac{1}{81}$ times

22. Virtual image are always formed with —
a convex mirrors and convex lenses
b concave mirrors and concave lenses
c convex mirrors and concave lenses
d concave mirrors and convex lenses

23. Keeping the pressure constant, for the same temperature difference which of the follwoing substance will have highest expansion?
a Pure water
b Kerosene
c Ice
d Oxygen

24.



How much current will flow in the circuit?
a 0.33 A b 1.2 A
c 3 A d 12 A

25. If $3.2 \times 10^{-4}C$ charged given to a capacitor of 40 μF —
i. an electric field will be formed
ii. its potential will be 8V
iii. 0.5 mJ Energy will be stored there
Which is correct?
a i and ii
b i and iii
c ii and iii
d i, ii and iii

Ans.																									
	1	b	2	d	3	a	4	c	5	d	6	c	7	a	8	b	9	c	10	a	11	a	12	d	13	c
	14	c	15	a	16	d	17	b	18	a	19	d	20	a	21	b	22	c	23	d	24	c	25	a		

34. Sylhet Board-2020

Physics Subject Code: 1 3 6

Time — 2 hours 35 minutes **Creative Essay Type Questions** Full marks — 50

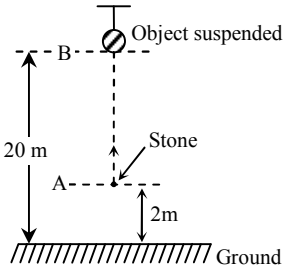
[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶A car of mass 5000 kg Starting from rest moves and after 50s its velocity becomes 10 m/s. After travelling 1 km with this acceleration it collides another car of mass 6000kg at rest. After collision both the car in a body is moving with a velocity 9 m/s.

a. Write down the 2nd law of falling body. 1
b. The travelled distance of a moving body is not zero but its displacement can be zero.—Explain. 2
c. Determine the acceleration of the car. 3
d. The changes of momentum of these two cars are not equal and opposite due to collision, why? Analyze the reasons. 4

2. ▶ **Scenario-1:** The number of division of vernier scale in slide calipers is 10 and the length of 1 smallest division of the main scale is 1 mm. The length of a rod obtained with the help of the instrument is 3.27 cm and main scale reading is 3.2 cm.

Scenario-2:



The stone of mass 50g is thrown vertically upward from the position A with a velocity 20 m/s. Acceleration due to gravity of that place is 9.8 ms^{-2}.

a. What is called periodic motion? 1
b. Explain why the value of efficiency is not greater than 1. 2
c. Determine the vernier superimposition in case of scenario-1. 3
d. Analyze the reason why the stone cannot displace the object suspended by thread in scenario-2. 4

3. ▶ **Scenario-1:** The densities of two liquid substances A and B are 1000 kgm^{-3} and 13600 kgm^{-3} respectively. Atmospheric pressure is 1.01×10^5Pa and g = 9.8ms^{-2}.

Scenario-2: The length of a rod at temperature 0°C is 2m. The co-efficient of surface expansion of the substance of the rod is $22\times10^{-6}K^{-1}$.

a. What is called solidification? 1
b. On which factors does heat capacity of an object depend? 2
c. Determine the final length of the rod if temperature of the rod is raised to 50°C in scenario-2. 3
d. Which one is suitable between A and B to construct a barometer in scenario-1? Express your opinion through analysis. 4

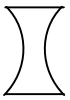
4. ▶ **Scenario-1 :** The length of an iron tube filled with liquid is 550m. The velocities of sound in the liquid and iron are 1450 ms^{-1} and 5150 ms^{-1} respectively.

Scenario-2 : A force is applied along the length of a wire of length 50cm. As a result its length becomes 50.02 cm.

a. What is called fluid friction? 1
b. In which cases is work not done? 2
c. Determine the strain in the light of scenario-2. 3
d. If one end of the tube of scenario-1 is struck once, then analyze the reason why more than one sound will be heard at another end of tube. 4

5. ▶ **Scenario-1 :** The radius of curvature of a convex mirror is 30 cm. An object is placed at a distance 60 cm away from the mirror.

Scenario-2 :



Person	Near Point	Far Point
A	20 cm	400 cm
B	15 cm	300 cm

Lens (Power, –0.33D)

a. What is called plane mirror? 1
b. In which cases does the refraction of light not take place? 2
c. Determine the distance of image in scenario–1. 3
d. Which defect of the person between A and B can be remedied with the help of the lens of scenario-2? Put your opinion through analysis. 4

6. ▶ **Scenario-1:**

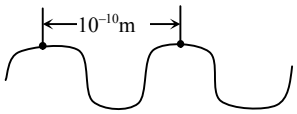


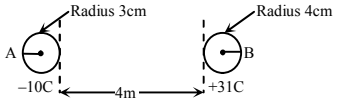
Fig: Wave

Scenario-2:

Patient	Description of disease	Doctor's Advice
A	Heart attack	Test C
B	Blockage of arteries	Test D

a. What is called isotope? 1
b. Why is the charge of alpha particle positive? Explain. 2
c. Describe the method of production of above mentioned wave in scenario-1. 3
d. Analyze comparatively the reasons why doctor suggests patient A to do test C and patient B to do test D. 4

7. ▶



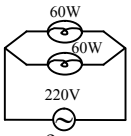
Charge of electron is 1.6×10^{-19}C.

a. Write down Ohm's law. 1
b. Why is semiconductor added with small amount of trivalent atom is called P-type? 2
c. Determine the number of electrons in the object A. 3
d. If the spheres A and B are touched each other and placed at same position again after touching, then what will be the change of the force between them? Give your opinion through analysis. 4

8. ▶ **Scenario-1:** In case of a transformer.

E_p	E_s	n_s	n_p
220V	–	2000	40

Scenario-2:



a. What is called carrier wave? 1
b. The specific resistance of a conductor changes with the change of temperature. — Explain it. 2
c. Determine the value of E_s in the light of scenario-1. 3
d. If the type of arrangement of the bulbs of scenario-2 is changed, then the change in electric current will be responsible to give less amount of light than earlier one. — Express your opinion through analysis. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which of the following names is considered as the founder of Optics?
a Scientist Newton
b Omar Khaiyam
c Ibne Al-Hayum d Al Khorgimi

2. When a rod is placed between the jaws of a slide calipers, the main scale reading is found to be 0.05 m, the Vemier super-imposition is 6 and if the Vemier constant is 0.1 mm, what is the length of the rod?
a 5.06 cm b 5.60 cm
c 0.65 m d 0.65 mm

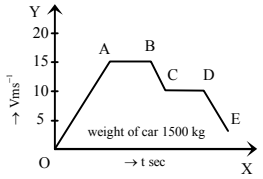
3. If an object is moving from rest with the uniform acceleration then velocity is —
a proportional to the square of that time
b inversely proportional to the square of that time
c inversely proportional to that time
d proportional to that time

4. Which force is an amazing force of Physics?
a Gravitational Force
b Electromagnetic Force
c Weak Nuclear Force
d Strong Nuclear Force

5. Which one of the following is the dimension of work?
a MLT^{-2} b ML^2T^{-2}
c ML^2T^{-3} d MLT^{-1}

6. Which are the renewabel energy?
i. Coal, Natural gas, Oil
ii. Light energy, Wind energy, Geothermal energy
iii. Ebb and flow of the waves of seas, Biomass
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

7. What is the protons number of uranium 235?
a 90 b 91
c 92 d 93



Answer the question numbers 8 and 9 according to the graph:

8. In which part of the graph, velocity increases in proportion to time?
a Part OA b Part AB
c Part CD d Part DE

9. What is the maximum kinetic energy?
a 3.38×10^5J b 3.38×10^4J
c 1.69×10^5J d 1.69×10^4J

10. The pressure of the liquid —
a Proportional to its depth
b proportional to its area
c inversely proportional to density
d equal to acceleration due to gravity

11. Which one of the following tests is needed to diagnose lung cancer?
a ETT and Endoscopy
b Endoscopy and Angiography
c Angiography and CT scan
d X-Ray and CT scan

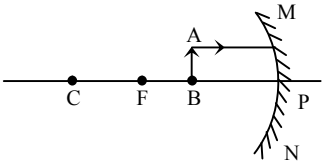
12. If final length of a copper rod becomes 10.0167 m for incrasing temperature 100°C, then what was the initial length of the copper rod? [co-efficient of linear expansion is $\alpha = 16.7 \times 10^{-6}K^{-1}$]
a 10 cm b 0.1 m
c 0.01 km d 0.1 km

13. In which medium the velocity of sound is highest?
a Iron b Diamond
c Mercury d Hydrogen

14. Which color of wave length is the shortest?
a Red b Green
c Yellow d Blue

15. Which one of the following properties of gamma rays?
a Electromagnetic wave and massless
b Made of two protons and two neutrons
c Its wavelength is very lwo and can be influenced by magnetic field
d The existence of this ray is not understood and its velocity is equal to the velocity of light

16.



According to above figure the nature and position of the image —
a erect and in front of the mirror
b inverted and behind the mirror
c virtual and magnified
d real and magnified

17. Refractive index is —
i. a number and has no unit
ii. in vacuum with respect to others medium, the value of refractive is index more than 1
iii. how many times the velocity of light is reduced in a medium
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

18. Which is the cause of Myopia?
a If the radius of the eye ball increases for any reason
b If the radius of the eye ball decreases for any reason
c If the power of convergence of the eye lense decreases
d Increasing the focal length of the eye lense

19. Which of the following contains free electron?
a Glass b Plastic
c Rubber d Aluminum

20. Which is the thermometric properties of matter?
a Mass b Volume
c Buoyancy d Density

21. Which is the correct relation?
a $I = \frac{R}{V}$ b $\sigma = \frac{R}{\sigma}$
c $R = \frac{\sigma L}{A}$ d $\sigma = \frac{R}{V^2}$

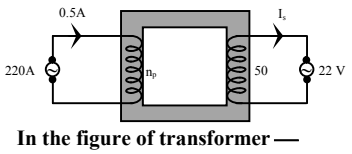
22. If the focal length of convex lense is 6 cm. and the object is kept 14 cm away from the optical center what will be the position, size and nature of the image?
a The principal focus, real and inverted
b Inside the principal focus, real and inverted
c Out of principal focus, virtual and magnified
d Between focal point and center of curvature, real and short

Answer the question nos. 23 and 24 using the above stem:
A bulb has 100W—220V written on it?

23. What is the resistance of the buld?
a $4.84 \times 10^{-3}\Omega$ b $4.84 \times 10^{-2}\Omega$
c $4.84 \times 10^{2}\Omega$ d $4.84 \times 10^{3}\Omega$

24. What is the value of the current flowing throught the bulb?
a 0.455 A b 4.55 A
c 44.5 A d 455 A

25.



In the figure of transformer —
i. $I_s = 5A$
ii. $N_p = 500$
iii. Voltage increases
Which one is correct?
a i and ii
b i and iii
c ii and iii
d i, ii and iii

Ans.																									
	1	c	2	a	3	d	4	a	5	b	6	c	7	c	8	a	9	c	10	a	11	d	12	c	13	b
	14	d	15	a	16	c	17	b	18	a	19	d	20	b	21	c	22	d	23	c	24	a	25	a		

35. Jashore Board-2020

Physics

Subject Code: | 1 | 3 | 6 |

Time — 2 hours 35 minutes

Creative Essay Type Questions

Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ To measure a diameter of sphere with the help of slide calipers, the main scale reading is 5 cm. Density of the sphere is 7.80gm/cc. Vernier super imposition is 9 and 19 divisions of main scale is coincide with 20 divisions on the vernier scale. The smallest division of main scale is 1 mm. The sphere was raised to a height of 50m from the ground, then it was let fall from the rest position.

a. What is called unbalanced force? 1
b. The mass of a matter is constant but weight is variable.—Explain it. 2
c. Find the radius of the sphere. 3
d. Above 15 meters height from the ground level, which energy will be more potential or kinetic energy? Explain it. 4

2. ▶ Here is the list of velocities of different times of a running vehicle :

Time(second)	0	2	4	6	8	10	12
Velocity(Metre/second)	14	12	10	8	6	4	2

a. What is called acceleration? 1
b. The motion of the hands of a clock is periodic but not harmonic. — Explain. 2
c. Determine what distance the vehicle will cross in the first 10 seconds? 3
d. Analyze the rate of change of velocity with the help of velocity-time graph. 4

3. ▶ A solid cylinder whose radius 5 cm and height 12 cm is dropped in the well which is fulfilled with water. The mass of the cylinder is 240g and density of water is $1000 kgm^{-3}$.

a. What is called Elasticity? 1
b. Why does lightening in the sky? Explain it. 2
c. Determine the pressure at the bottom of the well. 3
d. Will the cylinder float or sink in the water of well? Explain it. 4

4. ▶ The co-efficient of linear expansion of iron rod is $12\times10^{-6}K^{-1}$ whose length is 60 cm. A student observed that density becomes 7777.6 kgm^{-3} after increasing the temperature of the iron rod to 80°C. The density of iron is 7800 kgm^{-3}.

a. What is called specific heat? 1
b. Why does take shorter time to cook in the pressure cooker? 2
c. Determine the length of the iron rod due to changes of temperature mentioned in the stem. 3
d. Is it correct, the observation of the student? Analyze mathematically. 4

5. ▶

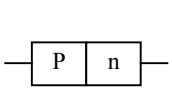


Figure-1

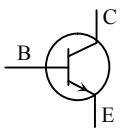
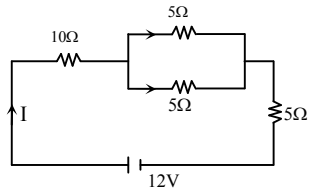


Figure-2

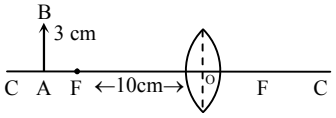
a. What is called an Integrated circuit? 1
b. Why it is suitable to use optical fiber to send electrical signal at long distance? Explain. 2
c. How does figure-1 connected with the circuit to convert AC to DC? 3
d. Using figure-2 explain with figure how to amplify the signal. 4

6. ▶



a. What is called Angiography? 1
b. Human body is as like as a machine.—Explain it. 2
c. Determine the equivalent resistance of above circuit. 3
d. What types of changes are necessary for the circuit mentioned in the stem for using in the residence? Write its merits and demerits. 4

7. ▶



An object AB is placed middle of centre of curvature and principal focus.

a. What is called lens? 1
b. Why rainbow is not seen at noon? 2
c. Determine the length of the image. 3
d. Is it possible to get a virtual and straight image by changing the position of the object AB in the figure? Explain by drawing ray diagram. 4

8. ▶ **Scenario-1 :** The number of turns in the primary coil of a transformer is 50 and the number of turns in the secondary coil is 500. 10V AC is applied in the primary coil.

Scenario-2 : Jasim fractured his right leg bone and felt chest pain, while playing football. Doctor advised him for two tests before operation. To know the condition of fractured bones with the help of one test and to do another test for the condition of heart.

a. What is called longitudinal wave? 1
b. Why is water wave a transverse wave? Explain. 2
c. What is the amount of voltage in the secondary coil according to scenario-1? 3
d. According to scenario-2, show comparative analysis between the two tests. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. What will happen for induce current when number of turns in the coil increases?
a Decreasing current flow
b Increasing current flow
c Value of current flow is zero
d Value of current flow will remain unchanged

2. Which of the following is a key factor in safe travel?
a Mass
b Weight
c Friction
d Motion

3. What is the potential of a point 100 m from the + 10C charge?
a 9×10^{9}V
b 4.5×10^{8}V
c 4.5×10^{9}V
d 9×10^{8}V

4. Intensity on the magnetic field of the solenoid is —
i. depends on current flow
ii. depends on the number of turns
iii. depends on the direction of the current flow
Which one is correct?
a i and ii
b i and iii
c ii and iii
d i, ii and iii

5. Where the image fromed in the eye?
a Choroid b Sclera
c Pupil d Retina

6. Which one is decrease when the pressure is decrease?
a Melting point
b Boiling point
c Specific heat
d Heat capacity

7. Who is the proponent scientist of the solar centric solar system?
a Newton
b Galileo
c Eratostenes
d Archimedes

8. Which of the following is the weakest force?
a Weak nuclei force
b Strong nuclei force
c Gravitational force
d Electromagnetic force

9. What types of work done by rectifier?
a Magnification of voltage
b One way electric current
c Decreasing electric current
d Magnification electric current

10. The vibration of an object produces sound waves. Which is possible for sound waves —
i. reflection
ii. refraction
iii. superposition
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

11. Which of the following relation is correct?
a $\alpha=\frac{\beta}{2}=\frac{\gamma}{3}$
b $\gamma=2\beta$ and $\beta=2\alpha$
c $\beta=\frac{\alpha}{2}=\frac{\gamma}{2}$
d $\alpha=\frac{\gamma}{2}=\frac{\beta}{3}$

Answer the questions no. 12 and 13 from the following stem:

Time (s)	0	5	10	15	20	25
Velocity (ms^{-1})	0	25	50	75	45	15

12. What is the nature of driving a car for first 15 seconds?
a Uniform acceleration
b Uniform velocity
c Uniform retardation
d Imbalance acceleration

13. For the cars —
i. travelling distance 562.5m for 15 second
ii. retardation 6 ms^{-2}
iii. total travelling distance 900
Which one is correct?
a i and ii
b i and iii
c ii and iii
d i, ii and iii

14. What is the unit of Young modulus (elasticity)?
a Nm b Nm^{-1}
c Nm^{-2} d Nm^{2}

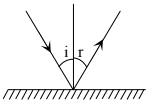
15. What is the part of 'n' in P-n-P transistor?
a Collector
b Base
c Ammeter
d Magnification

16. Mass of a man is 70kg when this man climb to the hill of 200m then how much work he will do? [g = 9.8ms^{-2}]
a 1.37×10^{5}
b 1.37×10^{-5}
c 1.372×10^{3}
d 1.372×10^{-3}

17. The source of renewable energy is —
i. high tide and low tide
ii. biogas iii. ocean currents
Which one is correct?
a i and ii b i and iii
c ii d i, ii and iii

18. If a piece of wood floats on water what percent of it will be immcrsed? [Density of wood, $\rho = 0.4\times10^{3}kg/m^{3}$ and density of water $\rho w = 10^{3}kg/m^{3}$]
a 40 b 50
c 70 d 100

19.



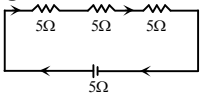
Which event indicate the following figure when < i = < r.
a Polarization b Difraction
c Reflection d Refraction

20. Which one is correct for the formation of the image on plane mirror?
a Object located to the same distance + from the mirror
b Size of the object is inequal
c Virtual image formed
d Inverted image formed

21. Which one is the current conductor?
a Wood b Plastic
c Glass d Gold

22. What ia the maximum value of refraction angle when its happened from density medium to rare medium?
a 45° b 60°
c 90° d 120°

Answer the questions no. 23 and 24 from the following stem:



23. From the figure —
i. voltage difference of the resistances is equal
ii. current flow of the resistances is equal
iii. equivalent resistance is 15Ω
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

24. What is the current flow of the circuit?
a 0.5 A b 1 A
c 15 A d 225 A

25. Which of the following is cure process of disease?
a Angiogram b Angioplast
c ECG d ETT

Ans.	1	b	2	d	3	d	4	a	5	d	6	b	7	b	8	c	9	b	10	d	11	a	12	a	13	a
	14	c	15	b	16	a	17	d	18	a	19	c	20	a	21	d	22	c	23	d	24	b	25	b		

36. Barishal Board-2020

Physics Subject Code: 1 3 6

Time — 2 hours 35 minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶

Velocity (m/sec)	0	4	8	8	8	4	0
Time (sec)	0	8	16	24	32	40	48

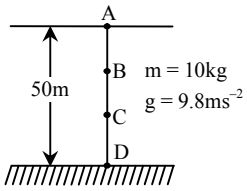
Velocity and time of a moving car is given in above chart.

a. Define average speed. 1
b. When an object is falling from a steady state, the velocity is changing—Why? 2
c. Calculate the distance of the car in 24 seconds. 3
d. According to the above chart draw an "acceleration Vs time" graph and analyse its nature. 4

2. ▶ A bicyclist started his journey from rest with $6ms^{-2}$ acceleration. After 5s he stopped his acceleration. Then after 10s he saw a speed breaker at a distance 150m and applied brake with 3 ms^{-2} acceleration.

a. Define sliding friction. 1
b. If the average velocity is zero the average speed should not necessarily be zero — Explain. 2
c. Calculate the distance by the bicyclist that would go before the brake applied. 3
d. According to the stem analyse the effect of friction on the motion of the cycle. 4

3. ▶



In the above figure the object comes down from position A to B without any resistance and have kinetic energy 1960 J.

a. Define potential energy. 1
b. The effective energy gained depends on efficiency—Explain. 2
c. Calculate the distance from position A to B. 3
d. If AC = 25 m, explain the transformation of energy at point A, C and D according to the law of conservation of energy. 4

4. ▶ In a hydraulic press the ratio of diameters of larger and smaller piston is 5 : 1. If the smaller piston travels some distance, the larger piston gains a force of 300 N.

a. Define stress. 1
b. Why air pressure decreases if vapour increases in air?—Explain. 2
c. Find the applied force on the smaller piston. 3
d. According to the stem, the works done are the same of the two pistons—Analyze with the help of "Principle of multiplication of force". 4

5. ▶ At 20°C temperature a piece of steel has area $200cm^2$. When the temperature is increased at 120°C its area became 200.668 cm^2.

a. Define heat capacity. 1
b. Write down an explanary difference between boiling and evaporation. 2
c. Calculate the co-efficient of volume expansion of the steel. 3
d. If the heated steel is put in water of 40°C placed in an aluminium pot, what will happen? Analyse with the help of "Fundamental principle of calorimetry". 4

6. ▶

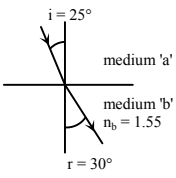
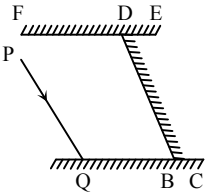


Fig-1

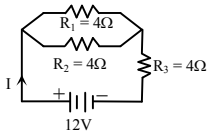


∠AQP = 60°
∠CBD = 120°
AC‖ EF

Fig-2

a. Define image. 1
b. In yellow light what will be the colour of green leaf? Explain. 2
c. In figure-1 find the velocity of light in medium 'a'. [Light velocity in vaccum is $3\times 10^8 ms^{-1}$] 3
d. In figure-2 finally PQ light will go in which direction? Explain with figure. 4

7. ▶



a. Stale Ohm's law. 1
b. Why nichrome wire is used in electric kettle? 2
c. If the resistance R_1 is doubled and its cross-sectional area is halved what is the final of this resistance? 3
d. Are the current flowing through all resistances same? Explain your opinion. 4

8. ▶

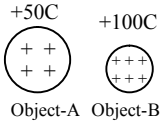


Figure-1

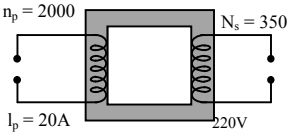


Figure-2

a. Define p—n junction. 1
b. Why the conductivity of a conductor is decreased by increasing temperature? 2
c. Calculate the electric current in secondary coil of fig-2. 3
d. By the object A in figure-1, is it possible to change a neutral object to positive charge and by the object B a neutral object to negative charge? Explain with figure. 4

Time — 25 minutes

Creative Multiple Choice Questions

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which one is the force of attraction between the electric pole and the transformer?
a Gravitational force
b Electromagnetic force
c Electro-weak d Nuclear force

2. If the velocity of a unit mass object is one unit then how much unit is the kinetic energy of that object?
a $\frac{1}{4}$ b $\frac{1}{2}$
c 1 d 2

3. Which one of the following is the multiplication of force and velocity?
a Work b Energy
c Power d Momentum

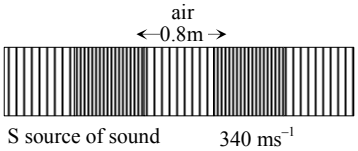
4. Why the weight loses by the object if it immerses into liquid?
a For upward force
b For downward force
c For surface tension
d For air pressure

5. Gas can be converted into plasma —
i. by apply strong magnetic field
ii. by applying huge amount of heat
iii. by applying strong electric field
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. If heat is applied to 100°C pure water, then —
i. temperature of the water will increase
ii. temperature of the water will unchange
iii. the water will convert into vapour
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

7. How much heat is required to convert 1 kg of ice at 0°C to water at 0°C?
a 3.34×10^6J b 34×10^3J
c 34×10^2J d 334J

See the following figure and answer the questions no. 8 and 9:



8. How much Hz is the frequency of S source?
a 136 b 272
c 425 d 850

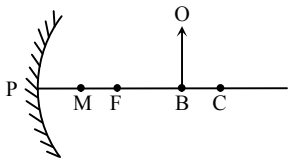
9. If the velocity of sound is increased then in the mentioned medium —
i. temperature will increase
ii. humidity of air will increase
iii. air pressure will increase
Which one is correct?
a ii and iii b i and iii
c ii d i and ii

10. For the safe use of electricity necessary thing is —
i. circuit breaker
ii. integrated circuit
iii. accurate connection of switch
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

11. In which medium the velocity of light is maximum?
a Water b Air
c Glass d Ice

12. Which one is the condition of total internal reflection of light?
a Angle of reflection = Critical angle
b Angle of incidence > Critical angle
c Angle of incidence < Critical angle
d Angle of incidence > Angle of refraction

See the following figure and answer the questions 13 and 14:



In figure PM = MF = 4cm

13. What is the radius of curvature of the mirror in cm?
a 8 b 12
c 16 d 20

14. What is the position of the image of the object BO?
a Between focus and pole
b At principal focus
c At center of curvature
d Between center of curvature and infinity

15. What is the relation between electric lines of force and electric intensity?
a Inversely proportional
b Proportional to square
c Directly proportional
d Equal

16. What is the relation between stress and strain?
a Inversely proportional
b Directly proportional
c Proportional to square root
d Proportional to square

17. Which one is constant in Ohm's law?
a Temperature b Resistance
c Flow of current
d Potential difference

18. In a transformer the voltage of primary coil is 10V and flow of current is 6A. If the voltage of the secondary coil is 20V then how much current flowing through the secondary coil?
a 1.4A b 0.3A
c 2A d 3A

19. What is the change in electric conductivity if the impure element is mixed with semiconductor?
a Increases b Decreases
c Remain unchange d Destroy

20. Which test will take place during exercise?
a Radiotherapy b ETT
c Angiography d MRI

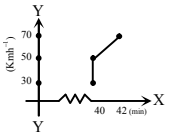
21. What is called the displacement of screw?
a Screw gauge b Least count
c Vernier constant d Screw pitch

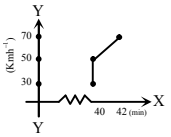
22. Which motion may be circular, hyperbolic or linear?
a Linear motion
b Translational motion
c Circular motion d Periodic motion

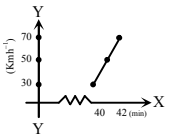
See the following information and give the answer of questions no. 23 and 24:
A car is moving with velocity 30kmh^{-1}, after 1 minute it gains a velocity of 50kmh^{-1} and again after 1 minute it gains a velocity of 70km^{-1}.

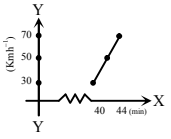
23. What is the acceleration of the car?
a 0.072 ms^{-2} b 0.082ms^{-2}
c 0.092ms^{-2} d 0.185ms^{-2}

24. Which diagram is appropirate for the moving of the car?

a 

b 

c 

d 

25. Which two ideas we will get from the concept of Newton's first law of motion?
a Force and inertia
b Force and momentum
c Inertia and momentum
d Inertia and energy

Ans.																									
	1	a	2	b	3	c	4	a	5	c	6	c	7	b	8	c	9	d	10	b	11	b	12	b	13	c
	14	d	15	c	16	b	17	a	18	d	19	a	20	b	21	d	22	d	23	c	24	c	25	a		

37. Dhaka Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶ Salman applies 5N force on a rest football of mass 400gm for 2 seconds over a field. The ball keeps on going towards Shakil who was standing 120m far. The value of the frictional force of the field is 1N.

a. What is displacement? 1
b. The velocity of a body moving with uniform speed may not be uniform.—Explain it. 2
c. What will be the acceleration after applying force? 3
d. Will the football be reached or not to Shakil? Analyze it with mathematical logic. 4

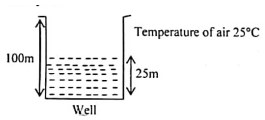
2. ▶ From rest Rony of mass 40kg, starts for school with $0.4ms^{-2}$ uniform acceleration and reaches at school after 70 seconds. The mass of Rony's elder brother Jony is 50kg and the height of the roof if their house is 20m.

a. What is efficiency? 1
b. If two papers of the same mass, one twisted and other one flat released from a certain height why does the twisted paper reach the ground before the flat paper? 2
c. What is the distance of Rony's school from his starting point? 3
d. Is it possible for Jony to reach the roof taking an object with him of mass 10kg by the equal work done by Rony? Give your opinion with mathematical argument. 4

3. ▶ The densities of the liquids in the pot 'A' and pot 'B' are 800 kgm^{-3} and 1260 kgm^{-3} respectively. The height of liquid in pot A is 50 cm. Due to dip an object of mass 250gm in liquid in pot A it loses of weight of 1.96 N.

a. What is called buoyancy? 1
b. Though heat is required to convert one state into another state of matter but temperature does not change.—Why? 2
c. Find the pressure of liquid at the bottom of the pot A. 3
d. What will happen if the object is fallen in liquid in pot B? 4

4. ▶



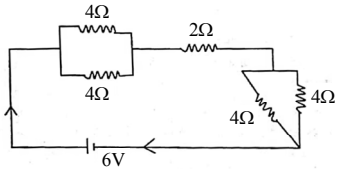
In summer when the temperature of air increases 10℃ the surface level of water of wells goes down 1 m.

a. What is time period? 1
b. Why the wave crest and the wave trough are not in same phase? Explain. 2
c. Determine the increasing temperature of air in Fahrenheit scale. 3
d. Will there be any difference in hearing the echos in case of before and after increasing the temperature? Give mathematical explanation for your answer. 4

5. ▶ The value of incidence angle is 65℃ and the refraction angle is 50℃ while the ray of light enters from the medium 'X' to medium 'Y'. Then the ray goes from medium 'Y' to Z. The refractive index of medium Z with respect to Y is 0.74.

a. What is lens? 1
b. Why the value of reflection angle is zero if the incident ray is fallen normally? 2
c. Find out the refractive index of medium 'X' with respect to medium 'Y'. 3
d. What will happen when the ray enters into 'Z' medium from 'Y' medium? Demonstrate with the help of figure. 4

6. ▶



a. State the Ohm's law. 1
b. Value of electromotive force is always greater than potential difference in a closed circuit.—Explain. 2
c. Calculate the value of equivalent resistance. 3
d. Design an electric circuit suitable for domestic purpose with given resistances where electromotive force will be unchanged and then compare the flow of electricity with stem. 4

7. ▶ The voltage of the primary coil of a transformer is 600V and electric current 2A. The number of turns of secondary coil of the transformer is 30 and electric current is 5A. The transformer is selected to run an electric motor of efficiency 50%. The motor can raise water of mass 200 kg at height 30 m by 98 sec.

a. What is electric motor? 1
b. Electron affinity is the reason for generating static electricity.—Explain it. 2
c. Determine the number of turns in the primary coil. 3
d. Is it possible to run the motor with the transformer? Give your opinion with mathematical analysis. 4

8. ▶

Experiment	Characters and uses
'A'	: Its wavelength is about 10^{-10}m : It can identify the stores in the gall bladder and kidneys.
'B'	: The three dimensional image is formed. : It is used for detection of cancer in liver, lungs and pancreas.

The velocity of light is $3 \times 10^8 ms^{-1}$

a. What is radio activity? 1
b. In normal condition all semi-conductors are free of charges. — Explain it. 2
c. Find out the frequency of the ray if 'A'. 3
d. To identify the diseases between 'A' and 'B' which one form distinct and extended image you think? Explain it logically. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Who was the pioneer of the experimental scientific methods?
a Thales b Kepler
c Roger Bacon d Huygen

2. Which of the following is the dimension of power of the lens?
a L^{-1} b L c T^{-1} d T

3. If electric power is constant, then —
i. multiplication of electric current and potential difference is constant
ii. resistance is inversely proportional to the square of electric current
iii. resistance is proportional to the square of potential difference
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

4. Properties of Alpha particle—
i. these particles are influenced by both the magnetic and electric field
ii. its mass is 9.11×10^{-23} kg
iii. these particles create florescence on zinc sulphide screen
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

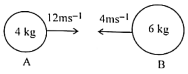
5. Which of the following is the most common form of energy?
a Heat energy b Sound energy
c Electrical energy d Mechanical energy

6. Which is the density unit?
a $kgms^{-1}$ b kgm^2
c kgm^{-3} d $kgms^{-2}$

7. Which experiment is recommended by the doctor to understand the condition of kidney's artery?
a ECG b Endoscopy
c ETT d Angiography

8. In which of the following the velocity of sound is more?
a Iron b Silver
c Water d Air

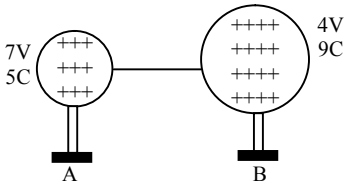
According to the following figure, answer the questions no. 9 and 10 : —



9. What is the value of combined velocity?
a $2.4ms^{-1}$ b $7.2ms^{-1}$
c $24ms^{-1}$ d $72ms^{-1}$

10. After combining in which direction the object will go?
a Direction towards the object A
b Direction towards the object B
c Will be rest
d Opposite to each other

11.

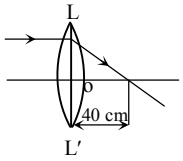


In case of A and B charged body —
i. some charges will flow from A sphere to B sphere
ii. electric lines of force will flow from A to B
iii. charge will flow until the potential difference
Which one is correct?
a i b ii
c i and iii d ii and iii

12. Which of the following is a transverse wave?
a Wave ray b Sun ray
c Sound wave d Wireless wave

13. The length of a body and the magnification of a convex mirror are respectively 0.8m and 0.5m, what is the length of image?
a 0.40 cm b 40 cm
c 160 cm d 400 cm

Observe the figure below and answer the questions no. 14 and 15 :—

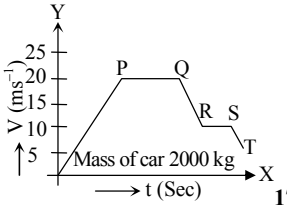


14. What is the power of the lens?
a – 0.025 D b – 2.5 D
c + 0.025 D d + 2.5 D

15. If an object is placed at a distance 15 cm from the lens, then, what will be the size and nature of the object?
a Real and diminished
b Virtual and diminished
c Real and magnified
d Virtual and magnified

16. Which is the thermometric properties of a matter?
a Mass b Density
c Resistance d Weight

Answer the questions no. 17 and 18 by using the following graph : —

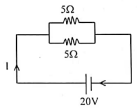


17. At which part of the graph velocity increases in proportion to time?
a Part of OP b Part of PQ
c Part of RS d Part of ST

18. What is the maximum kinetic energy?
a 2×10^4J b 2.5×10^4J
c 4×10^5J d 6.25×10^5J

19. If the focal length of concave mirror is 10 cm and distance of the object from the mirror is 5 cm. Then which one of the following is correct?
a Virtual and erect
b Virtual and Inverted
c Real and erect
d Real and Inverted

20. Which of the following objects contain free electrons?
i. Iron, Silver, Platinum
ii. Paper, Ceramic, Oil
iii. Copper, Tungsten, Nichrome
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii



21. How much is the value of I in the above circuit?
a $\frac{1}{2}$A b 2A c 4A d 8A

22. What is the frontal part of selerotic?
a Eye-ball b Cornea
c Iris d Choroid

23. Which is the unit of electric intensity?
a Nm b Nm^{-1}
c Nm^2C^{-2} d NC^{-1}

24. Which is semi-conductor?
a Boron b Germanium
c Aluminum d Phosphorus

25. Which one of the following are used electromagnetic induction in their working principles?
a Generator b Electric motor
c Transistor d Amplifier

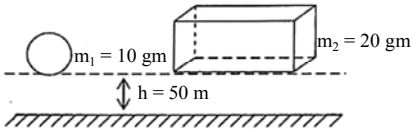
Ans.																										
	1	c	2	a	3	d	4	b	5	d	6	c	7	d	8	a	9	a	10	a	11	c	12	a	13	b
	14	d	15	d	16	c	17	a	18	c	19	a	20	b	21	d	22	b	23	d	24	b	25	a		

38. Rajshahi Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶



Effective force of m_1 is 0.078 N and effective force of m_2 is 0.039N.
These two objects are released at the same time.

a. What is balanced force? 1
b. Mass of object is constant but weight is not constant. — Explain. 2
c. Find out the frictional force of air on the object m_1. 3
d. Which object will reach the ground earlier? Analyze it with logic. 4

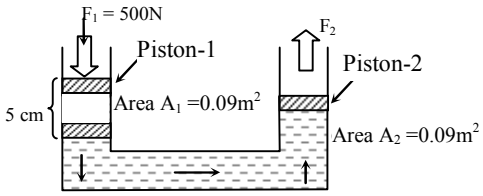
2. ▶ A loaded truck moving with a velocity of $10kmh^{-1}$ at a distance 10m away from a rail line applies brake suddenly to see a train running and stops in 5 seconds. Mass of empty truck and load are 1500kg and 400kg respectively.

a. What is motion? 1
b. Explain why the motion of earth around the sun is periodic motion but is not vibratory. 2
c. How much distance did the truck travel after applying brake? Find out. 3
d. If the truck is not loaded, driver can stop the truck easily. Analyze with logic. 4

3. ▶ An object of mass 20kg is released to fall freely from a place at a height 40m from the ground.

a. What is efficiency? 1
b. Explain why the unit of energy and work is same. 2
c. At what height from the ground will the potential energy be one third of kinetic energy? 3
d. Will the principle of conservation of energy follow at maximum height and after 2 sec of falling? Analyze your opinion through logic. 4

4. ▶

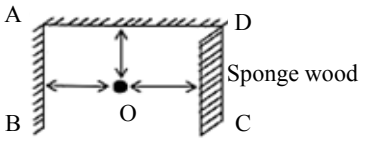


a. What is buoyancy? 1
b. Explain why utensils float on water. 2
c. Find out the value of F_2. 3
d. Is there any change of work done in both the pistons according to the given information's of the stem? Analyze it with logic. 4

5. ▶ When a copper sphere at temperature 30℃ is heated to the temperature 110℃, its volume becomes $32m^3$. Specific heat of copper is $400Jkg^{-1}K^{-1}$ and mass of copper sphere is 250gm. And the area of circular ring made of metal is $11.34m^2$.

a. What is regelation? 1
b. Temperatures of two objects are same but amount of heat may not be same.—Explain. 2
c. Find out the amount of heat gained by copper sphere. 3
d. If there is no loss of heat energy, will the heated copper sphere go through the metal ring of the stem? Analyze with logic. 4

6. ▶

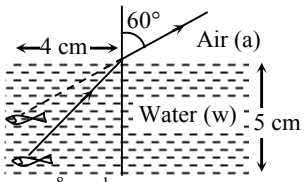


Temperature of air is 20°C.

At point O, a person produced a sound loudly.

a. What is wave? 1
b. Spring wave is longitudinal wave.— Explain. 2
c. Find out the minimum distance from O to AD to O hear an echo. 3
d. How many times will the person standing at point O hear echo at that temperature? Analyze your opinion with logic. 4

7. ▶

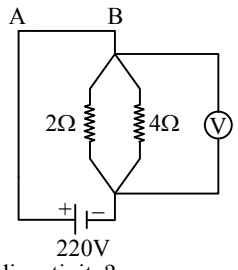


Velocity of light in air, $C_a = 3 \times 10^8 ms^{-1}$

$^a\eta_w = 1.33$

a. What is lens? 1
b. What do you mean by accommodation of eye? 2
c. Find out the velocity of light in water?. 3
d. How much high will the fish be seen from its real position? Analyze it with logic. 4

8. ▶



a. What is radioactivity? 1
b. Explain why the neutral point of two unequal positive charges is nearer to smaller one. 2
c. Find out the electric current of given circuit. . 3
d. If a resistance of 10Ω is connected between A and B, what will be the change of potential difference? Analyze it with logic. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. How much Farad is equal to one Pico Farad?
a 10^{-15} b 10^{-12} c 10^{12} d 10^{15}

2. What type of motion is the motion of the Earth round the sun?
a Periodic b Rectilinear
c Rotational d Vibratory

3. What type of frictional force does act at the time of getting down by a parachute?
a Rolling b Fluid
c Sliding d Static

4. Which measuring the length of a rectangular object by a slide calipers it is seen that the zero mark of the vernier scale has crossed 7.7cm of the main scale. 5th mark of the vernier scale has coincided with a mark of the main scale. The vernier constant of the device is 0.01 cm. What is the length of the object?
a 7.75cm b 7.705cm
c 7.65cm d 7.605cm

5. Which one of the following is the thermometric property of matter?
a Density, Latent heat
b Resistance, Specific heat
c Volume, Mass
d Pressure, Electric current

Answer the questions no. 6 and 7 on the basis of the diagram :
If an object is placed at a distance of 50cm from a mirror a real image is formed at a distance of 50cm.

6. What is the focal length of the mirror?
a 0.25m b 0.50m
c 1.00m d 2.50m

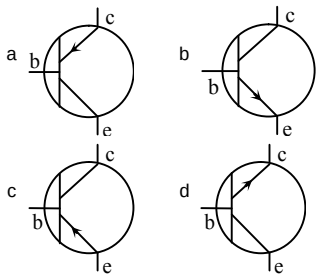
7. If the distance of the object from the mirror is increased by 10cm, in case of the produced image—
i. magnification < 1 and negative
ii. position is between C and F
iii. nature is real and inverted
Which one is correct?
a i b iii
c i and ii d i, ii and iii

8. One which does the specific heat depend?
a Mass b Temperature
c Heat d Material

9. The number of turns of the primary and secondary coil of a transformer are 30 and 150 respectively. If the electric current in the secondary coil is 2A what is the electric current in the primary coil?
a 0.1° b 0.4A
c 2.5A d 10A

10. Which one is used in the treatement of the leukemia of blood?
a ^{131}I b ^{32}P
c $^{60}C_o$ d ^{14}C

11. Which one of the following is the PnP transistor?

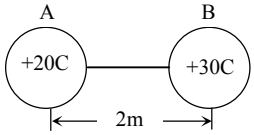


12. Which one is the dimension of power?
a MLT^{-2} b $ML^{-1}T^{-2}$
c ML^2T^{-2} d ML^2T^{-3}

13. By which test the three dimensional picture of lung, brain etc. is found?
a CT Scan b MRI
c Endoscopy d Angiography

14. If an object of mass 5kg is lifted by a device to the height of 15m in 2 minutes—
i. work done by the force of gravity is positive
ii. potential energy of the object is 75J
iii. the effective power of the device is 6.125 W
Which one is correct?
a i b iii
c i and ii d ii and iii

Answer the Question No. 15 and 16 from the following figure :—

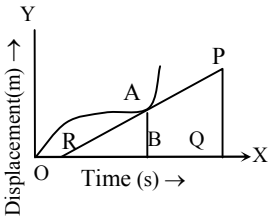


15. What is the value of force between the two charges?
a 1.5×10^2N b 3.0×10^2N
c 1.35×10^{12}N d 2.7×10^{12}N

16. The force between the two charges will be eight times if—
i. the distance between them will be eight times
ii. one charge will be double and another charge will be four times
iii. the product of the two charge will be double and the distance between them will be half
Which one is correct?
a i b ii
c ii and iii d i and iii

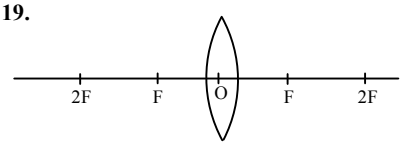
17. What are the colours of electron guns used in a colour television?
a Indigo, Green, Red
b Blue, Yellow, Red
c Violet, Yellow, Red
d Blue, Green, Orange

18.



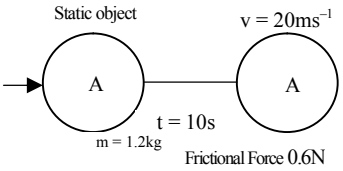
What is the velocity at point A?
a $\frac{AB}{BR}$ b $\frac{AB}{AR}$ c $\frac{PQ}{CQ}$ d $\frac{PQ}{PR}$

19.



For which position of the object in figure the magnification of the image will be less than 1?
a Between 2F and infinity
b Between 2F and F
c On F d Between F and O

20. Static object **$v = 20ms^{-1}$**



Frictional Force – 0.6N
What is the value of the applied force?
a −3N b 1.8M c 2.4N d 3N

21. What will happen if the height of the mercury level increases gradually?
a There is possibility of rain
b There is possibility of storm
c There will be depression
d The weather will be dry, clear

22. Which one of the following of equal volume has more Inertia?
a Iron b Gold c Ice d Silver

23. What is Rheostat?
a Circuit Braker
b Variable Resistance
c Fuse d Capacitor

24. In Which medium the wavelength of sound produced from a certain source is more?
a Air of temperature 0ØC
b Water c Iron
d Air of temperature 30ØC

25. How can the specific resistance of a definite conductor be increased?
a By increasing length
b By increasing the area of cross-section
c By increasing temperature
d By increasing resistance

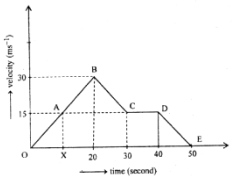
Ans.																											
	1	b	2	b	3	b	4	a	5	a	6	a	7	d	8	d	9	d	10	b	11	c	12	d	13	a	
	14	b	15	c	16	c	17	a	18	a	19	a	20	d	21	d	22	b	23	b	24	c	25	c			

39. Dinajpur Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶ The graph shows velocity—time of a car.



a. What is uniform acceleration? 1
b. Although the speed of the Earth around the sun is a periodic motion but not rotational motion. Explain. 2
c. Determine mathematically how much time indicate 'OX' in the graph. 3
d. How change is coming in acceleration when the car directly come from B point to E Point? Analyze mathematically. 4

2. ▶ A motor capable of lifting water at a height of 20m in 1 minute. The power of the motor is 1.96 kw and efficiency is 50%. But when the motor is damage, a man is lifting same amount of water in same height by using a pot. The capability of the water of the pot is 20kg and mass of the man is 48kg. The man is capable of lifting same amount of water takes time 2 minutes. The mass of the pot is 2kg.

a. What is potential energy? 1
b. Why the nuclear reaction is not environmentally friendly? Explain. 2
c. Determine the potential energy of the man with full of water pot at maximum height. 3
d. Whether it will change the efficiency of the two motors when you installed a new motor and the motor is lifting same amount of water in 30s. Analyze. 4

3. ▶ The radius of a solid rubber ball in round shape is 21cm. Mass of the ball 5kg. Density of the water 1000 kgm^{-3}. To immerse the ball into the water, a piece of iron enters into the ball. Mass of every iron piece ball is 5kg.

a. What is atmospheric pressure? 1
b. Why ice is floating in water? Explain. 2
c. Determine the density of the rubber ball. 3
d. Whether the ball sinks in the water when 10 iron ball entrance into the rubber ball. Analyze mathematically. 4

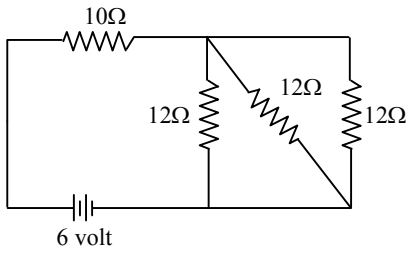
4. ▶ A steel fragment of mass 7 kg and volume 900 cm^3. To increase the temperature 20℃ to 50°C give heat this steel fragment. For steel the coefficient of length expansion is $11 \times 10^{-6}K^{-1}$ and specific heat 460 $Jkg^{-1}K^{-1}$. Specific heat of the water is 4200 $Jkg^{-1}K^{-1}$.

a. What is real expansion? 1
b. How the amount of water evaporates in the air regulates vaporization? Explain. 2
c. Determine the volume expansion of the steel for increasing the temperature that mention in the stem. 3
d. Is it possible to melt ice of 0.5kg at 0℃ temperature fully from the necessary heat that produce to increase the temperature of the steel? Analyze mathematically. 4

5. ▶ A light ray comes from air and refracted to glass. In this case incident angle is 20℃ and refracted angle is 13.18℃. The focal length of a lens is 20cm.

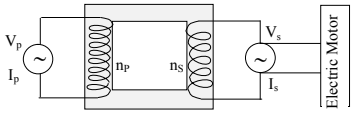
a. What is principal focus of a lens? 1
b. How to use refraction of light in telecommunication? Explain. 2
c. Determine the refractive index of the lens with respect to air. 3
d. The image formation is not equal from lens, optical center to 30cm and 15cm distance of the principal axis. Analyze with level diagram. 4

6. ▶



a. What is resistance? 1
b. What is the reason for low resistance use in earth connecting wire? Explain. 2
c. Determine the equivalent resistance of the circuit that mention in the stem. 3
d. How to arrange the resistances of the circuit to get almost 3.14 W electric power? Show with mathematical analysis. 4

7. ▶ 2HP electric motor is connected by secondary coil of a step down transformer. Below the level diagram of the transformer: —



Here, $n_p = 100$, $E_p = 1000$ volt,
$n_s = 30$ and $I_p = 1.5$ amp.

a. What is generator? 1
b. Why electric motor used in electric fan? Explain. 2
c. Determine the resistance of the principal coil. 3
d. Whether it is capable to electric motor by the transformer that mention in the stem? Analyze mathematically. 4

8. ▶ Some time Mr. Mubin feels chest pain. When he goes to doctor, the doctor advises him for ECG test. For observing the ECG test the doctor said him for ETT test.

a. What type of radiation X-ray? 1
b. Which experiment is more secure for testing on bile stone? Explain. 2
c. Describe the mechanical techniques of performing the first test. 3
d. Analyze the rationality of counseling for the second test. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Who measured the velocity of light by studying the eclipse of a satellite of Jupiter?
a Galileo b Romer
c Kepler d Copernicus

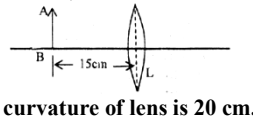
2. Which is vector quantity?
a Work b Speed
c Force d Energy

3. The inertia of a body depends on its —
a mass b displacement
c acceleration d velocity

4. In case of freely falling body —
i. the acceleration is remain unchanged
ii. velocity is proportional to time
iii. displacement is proportional to time
Which one is correct?
a i b ii
c i and ii d i and iii

5. What kind of friction is created on flying bird?
a Rolling friction
b Sliding friction
c Static friction
d Fluid friction

Observe the figure below and answer the questions no. 6 and 7 :—



Radius of curvature of lens is 20 cm.

6. What is the power of lens?
a + 0.1D b + 5D
c + 6.67D d + 10D
Note: Power couldn't be determined because of don't having equal curvature in both sides and also for the absence of the co-efficient of refraction in the lens.

7. The image of AB is —
i. real and inverted
ii. virtual and erect
iii. large from AB
Which one is correct?
a i b ii
c i and iii d ii and iii
Note: Without knowing the radius of curvature of the other side and co-effcient of refraction in the lens it is not possible to answer this question.

8. Where convex mirrors are used?
a Overhead projector
b Reflecting telescope
c To examine ear and throat
d Search light of steamers

9. To produce biogas, we keep the ratio of cow-dung and water is —
a 1 : 2 b 2 : 1
c 2 : 3 d 4 : 5

10. Which Isotope is used for Blood-Leucaemia due to the much increase of white blood cell?
a Phosphorus-32 b Iodine-131
c Cobalt-60 d Technetium-99

11. Where is felt more pressure in same depth from the surface of water?
a Pond b River
c Sea d Haor

12. If the masses of all the matters are equal and if you want to reduce 1K temperature, then which object will lose more heat in below?
a Hydro vapour b Pure water
c Copper plate d Silver jewelry

13. In a transformer the voltage of a primary coil is 24V and current 2A. The current of secondary coil is 6A. What is secondary voltage?
a 0.0139 V b 0.125 V
c 8 V d 72 V

14. Velocity of sound in air 350 ms^{-1}. An object that creates the sound in air, its wavelength is 1250 cm. How much is the period of time?
a 28s b 3.571s
c 0.28s d 0.0357s

15. Which flowing device is produced periodic flow from mechanical energy?
a A-C generator b Electric motor
c Step up transformer
d Step down transformer

16. Which metal is transformed from radium by radioactive disintegration?
a Polonium b Thorium
c Lead d Actinium

Read the following stimulus and answer the questions no. 17 and 18 :

Mass of a solid is 68gm and volume is 80cc. Which is not soluble in water and kerosene. If the temperature is increased to 30℃, its volume become 80.015cc. Density of water is 1000 kgm^{-3} and density of kerosene is 810 kgm^{-3}.

17. What is the coefficient of liner expansion of solid?
a $6.25\times10^{-6}\ K^{-1}$ b $2.083\times10^{-6}\ K^{-1}$
c $3.125\times10^{-6}\ K^{-1}$ d $4.166\times10^{-6}\ K^{-1}$

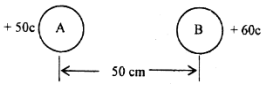
18. The solid object is —
a floating in the water but sinking into kerosene
b floats being immersed in kerosene
c sinking into both liquids water and kerosene
d floating in the both liquids water and kerosene

19. What will happen in the case of man if he fans with a hand fan?
a Mechanical energy is transformed into sound
b Nuclear energy is transformed into mechanical energy
c Chemical energy is transformed into mechanical energy
d Chemical energy is transformed into heat.

20. Which of the following is used to disconnect the electric supply in a definite part of house?
a Circuit breaker b Switch
c Fuses d Earth wire

21. Which medium of the following is the lowest velocity of sound?
a Water b Natural gas
c Glycerin d Alcohol

The work is equal to bring following two charges from infinity to a point in an electric field.



From the information above answer the questions no. 22 and 23 : —

22. What is the value of repulsion force between the two charges?
a 1.08×10^{10} N b 5.4×10^{11}N
c 5.4×10^{13}N d 1.08×10^{14}N

23. To connect the two charges with a connecting wire —
i. some charge will flow from A to B
ii. some charge will flow from B to A
iii. the charge flow will continue until the voltage is equal
Which one is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

24. The unit of work is —
i. a derived unit
ii. kgm^2s^{-2}
iii. Joule
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

25. Which one of the following has more conductance?
a Copper b Tungsten
c Silver d Nichrome

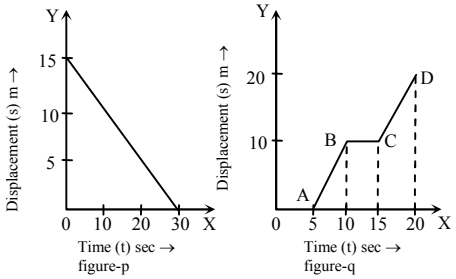
Ans.																									
	1	a	2	c	3	a	4	c	5	d	6	*	7	*	8	a	9	a	10	a	11	c	12	b	13	c
	14	d	15	a	16	c	17	b	18	a	19	c	20	b	21	b	22	d	23	b	24	d	25	c		

40. Cumilla Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶ The nature of applied force on a car has been shown in two graphs:



a. What is called the units of measurement? 1
b. Why is walking hard on a muddy road? Explain. 2
c. Calculate the distance travelled by a car of Figure P. 3
d. Analyze the velocity of different situation of a car from the graph–Q. 4

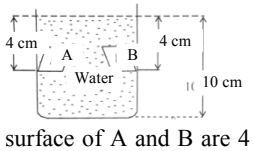
2. ▶ Physics' teacher gave to first student such as wire of inside copper, substance of cylinder shape, raw iron, battery and told second student to make series and parallel circuit giving conducting wire, battery, key, three resistances of same magnitude.

a. What is the electro-magnetic induction? 1
b. Why is a thick conductor used for supplying electricity at long distance? Explain. 2
c. How will first student can make electro-magnet giving equipments of the stem that explain according to your textbook. 3
d. Analyze your comments with figure how will the electric current of making two circuit of second student. 4

3. ▶ The mass of Rahim and Karim are 40 kg and 80 kg respectively. Both of them reached the destination of 200 m starting from same place at 100 sec and 200 sec respectively. After completion of the competition their Science teacher told, "Both of your have same work done but power is different."

a. What is called efficiency? 1
b. Why effective energy depends on efficiency? Explain. 2
c. Determine the power of the 1st boy if the efficiency is 40%. 3
d. What is the significance of the comment of Science teacher? Give your opinion. 4

4. ▶



Area of the two surface of A and B are 4 cm^2 and 16 cm^2 respectively. Density of water is 1000 kgm^{-3}.

a. What is called atmospheric pressure? 1
b. Why atmospheric pressure is reduce with the increase of altitude? Explain. 2
c. Determine the applied pressure due to water at the bottom of the surface. 3
d. "The pressure is same but the force is different for the surface of A and B."—Analyze the comment by mathematical analysis. 4

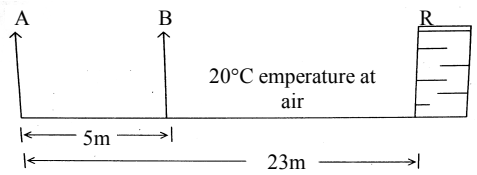
5. ▶ **Scene 1 :** The information data of the object P and Q are given below :

Object	Mas	Specific heat	Temperature
P	100 gm	600 $Jkg^{-1}K^{-1}$	68°F
Q	200 gm	500 $Jkg^{-1}K^{-1}$	120ØF

Scene-2 : The student of class X has pressed two pieces of ice at temperature of – 1ØC by hands, then the pieces of ice unite together to form a single piece. But at – 2ØC, two pieces of ice cannot unite together though it has been given same pressure.

a. What is called melting? 1
b. Why evaporation produces cooling? Explain. 2
c. In scene 1, how much heat will exchange if the two objects of P and Q will in thermal contact? 3
d. In scene-2, explain the above incident in the light of the textbook. 4

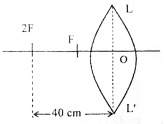
6. ▶



A person at 'A' produces a sound of frequency 120 Hz, another person 'B' hears the echo.

a. What is called intensity of sound? 1
b. Why sound is one kind of wave? Explain. 2
c. Determine the wavelength of the produced sound. 3
d. Is it possible to hear echo by the person at 'B' at temperature 40ØC for the same produced sound? Explain by your logic. 4

7. ▶



a. What is called optical centre? 1
b. In the evening, why the pitch covered road are seen like water? Explain. 2
c. Determine the power of the above lens. 3
d. What type of defect of vision can be remedy by the above lens? Explain by drawing ray diagram. 4

8. ▶ $R_P = 350$
$R_s = 750$
$E_p = 220V$

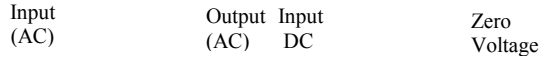


Fig:1 Fig:2

a. What is called IC? 1
b. Why system loss occurred? Explain. 2
c. From figure-1, calculate the voltage of the secondary coil. 3
d. In figure-2, why the output voltage is zero? Explain by your logic. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

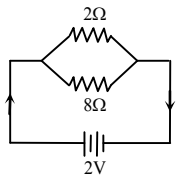
1. Following which one is correct when the car tires are old?
a It is possible to stop the car at specific places
b Necessary opposite force is created
c Decreasing the value of friction force
d The car is moving forward

2. The length of a wire is 15m, cross section area is $2.07 \times 10^{-2}m^2$ and the resistance is 75Ω then for the wire —
i. specific resistance is 1.035×10^{-6} Ω–m
ii. conductivity is 9.66×10^{5} $(\Omega\text{–m})^{-1}$
iii. if the length is twice then the resistance will be twice
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

3. The pressure created in the lower part by the liquid of the pot that fill up fully liquid does not depend on?
a Acceleration due to gravity
b Height of the liquid column
c Density of the liquid
d Bottom area

4. Which is propagated with the wave?
a Force b Mass
c Momentum d Energy

5.



What is the power of the circuit in the diagram?
a 0.4 W b 0.8 W
c 1.25 W d 2.5 W

6. Following which one is the temperature of triple point of water?
a 273∅C b 273K
c 273.26K d 373∅C

7. Which one is correct when fired from a gun?
a The kinetic energy of the bullet is more than the rifle
b The acceleration of the bullet is less than the rifle
c The momentum of the bullet is more than the rifle
d The action force of the rifle is less than the opposite force of the bullet

8. Flow of charge depends on which?
a Resistance of the conductor
b Electrical potential
c Electric intensity
d Electric force

9. An object is placed 20cm away from a concave mirror with a curvature of radius is 20cm. How much is the distance of the image?
a 0 b 0.05cm
c 20cm d ∝

10. Two charge of value + 4C and +6C are placed 10cm away from each other. The charge was then removed by adding two chargers to one of the conductor wire. How much functional force act here?
a 2.16×10^{9}N b 2.25×10^{9}N
c 2.16×10^{11}N d 2.25×10^{11}N

Note: $q = q_1 = q_2 = \frac{4+6}{2}C = 5C \therefore F = \frac{q^2}{4\pi\in_0 r^2} = 9\times10^{9}\times\left(\frac{5}{0.1}\right)^2 = 2.25\times10^{13}N$

11. Evaporation of the liquid depands on what?
a Density b Height
c Volume d Nature

12. From which definitions of force are found in Newton's formula?
a First equation of motion
b Second equation of motion
c Third equation of motion
d Gravitational law

13. Which type of smoke emit in the col-fired thermal power station?
a Carbon b Phosphorus
c Sulfur d Thorium

14. Which one is dimension of momentum?
a MLT^{-1} b MLT^{-2}
c ML^2T^{-1} d ML^2T^{-3}

15. What is the value of linear magnification when one man stood in front of the mirror and saw twice length image in the mirror?
a 0.5 b 1 c 2 d 4

Two bodies of mass 1500gm and 2000gm is falling down from the roof of height 20m.
Answer the questions no 16 and 17 according to the stem :—

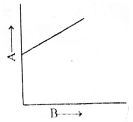
16. What is the value of potential energy of the first body from ground to 20cm height?
a 294000 J b 2940 J
c 294 J d 2.94 J

17. Following which one is correct for two falling bodies?
a At maximum height potential energy same
b For touching of ground velocity different
c Different time needs for touching of ground
d For touching of ground kinetic energy different

18. If the coefficient of linear expansion, superficial expansion and volume expansion are α, β and γ respectively then—
i. $\frac{\beta}{\alpha}=\frac{1}{2}$ ii. $\frac{\beta}{\gamma}=\frac{2}{3}$
iii. $\frac{\gamma}{\alpha}=3$
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

19. To create P-type semiconductor, which type of element added in pure Silicon element?
a Phosphorus b Carbon
c Antimoney d Boron.

20.



The graph shows the change of A with the help of B. For the simple linear motion of the particle is—
i. B indicates time
ii. A indicates distance when velocity of the particle is uniform
iii. A indicates velocity when the acceleration of the particle is uniform
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

21. Which one is correct for step up transformers?
a Increasing voltage
b Increasing current
c Decreasing electrical energy
d Increasing electrical power

22. Which frequency of sound used in ultrasonography?
a 1—10Hz b 1–10KH_z
c 1–10MH_z d 1–10GH_z

23. What is the name of semi-transparent light sensitive membrane which located innermost side of the eye ball and colour is pink?
a Sclera b Choroid
c Iris d Retina

24. The refractive index of air with respect to water is 0.75 and the velocity of light in air is $3\times10^{-8}ms^{-1}$ then what is the velocity of light in water?
a $4.43\times10^{9}ms^{-1}$ b $2.50\times10^{9}ms^{-1}$
c $3.99\times10^{8}ms^{-1}$ d $2.25\times10^{8}ms^{-1}$

25. Which one is the unit of elastic coefficient?
a $kgms^{-1}$ b $kgms^{-2}$
c kgm^2s^{-2} d $kgm^{-1}s^{-2}$

Ans.																										
	1	c	2	a	3	d	4	d	5	b	6	b	7	a	8	b	9	c	10	*	11	d	12	a	13	c
	14	a	15	c	16	d	17	d	18	c	19	d	20	d	21	a	22	c	23	d	24	d	25	d		

41. Chattogram Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶ The velocity of a car with time is given in the table below :—

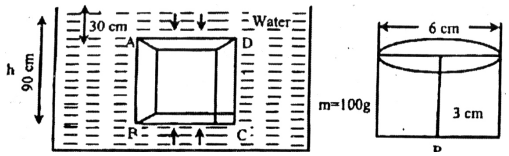
Time (s)	0	10	20	30	40	50	60	70
Velocity (ms^{-1})	0	2	4	6	8	10	12	14

a. What is called vibratory motion? 1
b. "Acceleration due to gravity is a derived quantity." — Explain. 2
c. Calculate the distance travelled by the car after first 1 min 10 sec. 3
d. From the stem, with the help of velocity-time graph, explain the rate of change of velocity at the time of 30 sec instant. 4

2. ▶ An engine of power 1kW can lift 100kg of water at a height of 5m in 10 second.

a. What is called balanced force? 1
b. The velocity is not same when same force applied on the two objects. — Explain. 2
c. Determine the amount of work done to raise the whole water. 3
d. If takes 2s more time to raise whole water then what will be the change of efficiency? Analyze mathematically. 4

3. ▶



Density of water is $100kgm^{-3}$, Acceleration due to gravity is $9.8ms^{-2}$, Area of the ABCD = $800cm^2$.

a. What is called stress? 1
b. Why does not the shape of a human body change in atmospheric pressure? 2
c. Determine the magnitude of buoyancy on the ABCD solid body. 3
d. If the obejct 'P' is let free in the water of the vessel then will it immerse in liquid or float on it? Analyze. 4

4. ▶

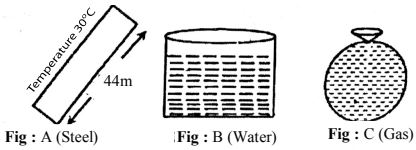
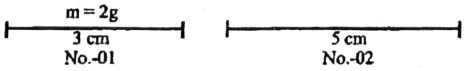


Fig : A (Steel) **Fig :** B (Water) **Fig :** C (Gas)

The co-efficient of volume expansion of steel is $33\times10^{-6}\ K^{-1}$.

a. What is called fixed point? 1
b. The velocity of the sound in air depends on temperature — Explain. 2
c. Determine the length of the steel plate in 38∅C temperature. 3
d. The expansion of A, B and C are different by applying heat—Analyze. 4

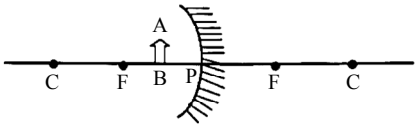
5. ▶



Two copper wire are taken in above figure. Specific heat of copper is 400 $Jkg^{-1}K^{-1}$ and the co-efficient of superficial expansion of copper is $33.4\times10^{-6}K^{-1}$.

a. What is called pitch of sound? 1
b. Why the velocity of sound is more in sea water than pure water? 2
c. What amount of heat will be needed to increase the temperature 10∅C of a No.-01 wire? 3
d. Will the linear expansion be equal if the temperature increases up to 20∅C of two wires? Analyze it. 4

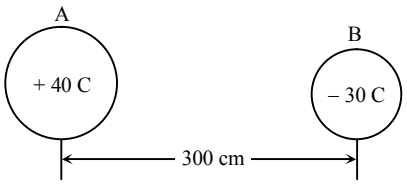
6. ▶



PC = 80 cm, PB = 30 cm.

a. What is convex lens? 1
b. Why the angle of incidence of total internal reflection is greater than critical angle? 2
c. Determine the magnification of object AB. 3
d. If ther object is placed 50 cm away from the optical centre then what will be the position, size and nature of the image? Explain with the help of ray diagram. 4

7. ▶



[Coulomb's constant, $C = 9\times10^9 Nm^2C^{-2}$.]

a. What is called electric potential? 1
b. Why is the electric current decrease, when internal resistance increase? 2
c. Find the amount of force between A and B. 3
d. Where electric field intensity will be equal along the connecting line of A and B? Analyze. 4

8. ▶ Doctor prescribed a medical test to Mr. Ahad for diagnosis partial blockage in the arteries of heart. During the rest, he spent time by using Computer and Mobile.

a. What is called generator? 1
b. Why step down transformer is used in electric watch? 2
c. Describe about the medical test prescribed by doctor. 3
d. What steps can be taken to effective use of two devices which are mentioned in the stem? Explain. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which one condition of the following is very essential in reference to falling body?
a Falling from rest
b Velocity is proportional to time
c Air is essential
d Distance is proportional to the square of the time

2. The wire of arrow bow kept drawn, it is created —
i. potential energy
ii. balance force
iii. stress
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

3. If Sumon falls down to walk on the muddy road, which kind of friction is created?
a Sliding friction b Rolling friction
c Fluid friction d Static friction

4. Which is the measure of the inertia of a body?
a Motion b Rest
c Mass d Force

5. What is the relation between the total amount of heat energy of a substance and the sum of the kinetic energy of the molecules?
a Proportional
b Inversely proportional
c Squarely proportional
d Square inversely proportional

6. Which one is the dimension of energy?
a ML^2T^{-3} b ML^2T^{-2}
c MLT^{-2} d MLT^{-1}

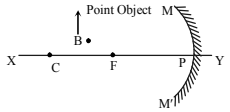
7. Without which quantity of the following Hooke's law will be invalid?
a Elastic limit
b Modulus of elasticity
c The strain of a body
d The stress of a body
Note: Hooke's law: Within elastic limits stress is directly proportional to strain. There is a constant relating stress to strain for each material; the name of this constant is modulus of elasticity. So, the above 4 statements are important with young's law.

8. What is the atmospheric mercury pressure on Everest Mountain Peak?
a 76 cm b 53.2 cm
c 24 cm d 22.8 cm

9. An electromotive force of 10 V and internal resistance of 1Ω. If the amount resistance of 2Ω and 4Ω respectively is connected with series and parallel connection separately with the circuit, how much will the difference of electric current be?
a $\frac{40}{7}$ A b $\frac{30}{7}$ A c $\frac{20}{7}$ A d $\frac{10}{7}$ A

10. What is called the overall condition of motion of a oscillatory particle?
a Phase b Amplitude
c Time period d Frequency

11. Is the entire house is illuminated due to what reasons below?
a Regular reflection
b Internal reflection of light
c Diffused reflection
d Refraction

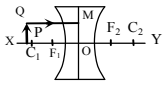


12. In light of the information from the above picture which one is correct?
a Reflected ray converts into a divergent ray
b At least two rays will be taken for the image of 'B'.
c PC is called the focal length
d XY is called secondary axis

Read the following passage and answer the questions no. 13 and 14:—
If a student of the class ten reduces and increases the height of wood of length of 1.5 m, he would determine the time of 0.3s and 0.2s of falling marble by helping stop-watch. Again he taking slide-callipers and screw-gauge and saw, 20 vernier scale divisions are equal to 19 mm, smallest main scale divisions and if the circular scale of 50 divisions is rotated once the distance travelled along the linear scale of 0.5 mm. He determine the area of the wire by determining the diameter of the wire.

13. What is the average speed of the marble?
a 3 ms^{-1} b 5 ms^{-1}
c 6.25 ms^{-1} d 7.5 ms^{-1}

14. In light of the information of the stem—
i. screw gauge is five times more keen than slide callipers
ii. the amount of error of area of a wire does not depend on the value of diameter of the wire
iii. the amount of least count is 10pm
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii



15. In light of above picture, which one is correct?
a Image will be magnified all times
b Focal length will be negative
c Refracted ray will go through F_2
d F_2O is called the radius of curvature

16. What is called the mechanical process to save energy in the form of electric charges?
a Potential b Diode
c Capacitor d Battery

17. How much force is experienced by a body of charge 15 C when it is placed in a electric field of electric intensity $20NC^{-1}$?
a 0.75N b 1.33N
c 5N d 300N

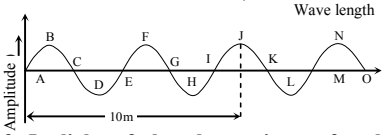
18. On what condition the specific resistance depends at a particular temperature?
a Physical condition of the material
b Heat
c Materials of the conductor
d The purity of conductor

19. What is the commutator produced by?
a Aluminium b Copper
c Steel d Iron

20. The number of turns in the primary coil of a transformer is 50 and that of the electric current is 5A. If the number of turns in the secondary coil is 500, what is the current in the secondary coil?
a 5000A b 50A c 2A d 0.5A

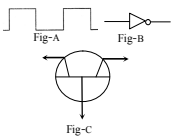
21. In which instrument transducer is found?
a Ultrasonography b X-ray
c Endoscopy d MRI

22. Angiography is used to detect —
i. tumer in uterus
ii. diseases in coronary arteries
iii. block of veins
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii



23. In light of the above picture for the wave —
i. wave length is 4.44 m
ii. B and N is the same phase
iii. the nature of the wave is transverse wave
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Answer to the questions no. 24 and 25 in light of the following Picture : —



24. Which one is correct of the following for fig : A?
a It is changed continuously
b It can be changed in discontinuous
c It can be cross-connectioned
d It is to do reamplification to remain alive

25. In light of the information for Fig: B and Fig: C —
i. Fig: B workes as a rectifier
ii. Fig: C can be converted into the electric current and voltage
iii. Fig: C works as a light speed switch
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

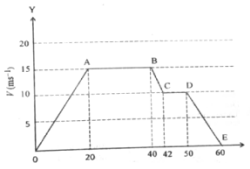
Ans.																									
	1	a	2	d	3	a	4	c	5	a	6	b	7	*	8	d	9	c	10	a	11	c	12	b	13	c
	14	b	15	b	16	c	17	d	18	c	19	b	20	d	21	a	22	c	23	a	24	b	25	b		

42. Sylhet Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶ The graph shows velocity-time of a car :



⟶ t (second)

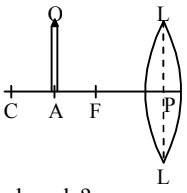
Mass of car 2000 kg

a. What is reference frame? 1
b. Which one is more difficult to stop a private car and a freight truck at the same distance in a specific direction? Explain. 2
c. Determine the distance of the first car travelled in 15 seconds. 3
d. If Y-axis in graph represent height (unit meter), in the stem then compare the Potential and Kinetic Energy of the two graph of height vs time and velocity vs time. 4

2. ▶ The velocity of bowl of a cricket bowler are 150 km/hour and 154 km/hour respectively. The mass of the cricket bowl is 250 gm. [g = 9.8 ms^{-2}]

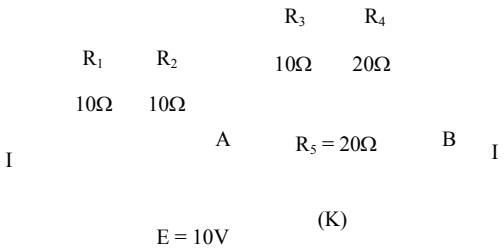
a. What is the dimension? 1
b. After breaking the car, why did it not stop going a little further? — Explain. 2
c. How far it will reach when the bowler throw bowl vertically of the first velocity? Determine it. 3
d. Whether the speed of both velocity of the bowl is the same as the ratio of kinetic energy and that potential energy mentioned in the stem? Analyze mathematically. 4

3. ▶



a. What is critical angle? 1
b. Why do not we see in the dark room? Explain. 2
c. Draw an image of the mentioned object 'AO' in the stem. 3
d. To remove which type of defects of the eye used the mentioned lens in the stem? Explain with ray diagram. 4

4. ▶

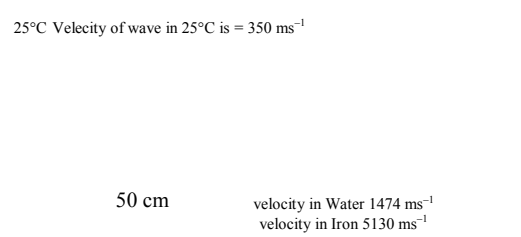


a. What is electromotive force? 1
b. Will the resistance be changed when you cut 100 meter wire of the equal part by the area of cross-section if the temperature, material and area of cross-section is constant? Explain. 2
c. Determine the equivalent resistance. 3
d. Which one is more powerful among the resistance R_1, R_3 and R_5? Analyze mathematically. 4

5. ▶ The distance of two electrical poles is 50 m and summer season the temperature of air is 30℃. These two electrical poles are connected with copper wire of 50.033 m length. In Winter season the temperature of air is 5℃. [Mass of the copper wire is 30 kg and specific heat 400 $Jkg^{-1}K^{-1}$]

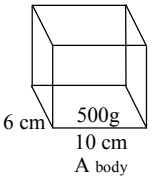
a. What is freezing point? 1
b. How to travel bats using the ultrasonic sound? Explain. 2
c. How much heat energy is given up by the Copper wire in winter season?. 3
d. In winter, is there any kind of possibility of tearing of the Copper wire? Analyze mathematically. 4

6. ▶ Velocity of wave in 25℃ is 350 ms^{-1}



a. What is echo? 1
b. Diagnosis of disease ultrasonic sound is used. — Explain. 2
c. Express the temperature that is mentioned in the stem in Fahrenheit scale. 3
d. Will it be equal wave length in water and iron if a wave of same frequency is passing that mention in the stem? Analyze. 4

7. ▶ Density of A body is 1.04 gm cm^{-3}



Substance	Density
Water	1000 kg/m^3
Glycerin	1260 kg/m^3

[g = 9.8 ms^{-2}]

a. What is pressure? 1
b. Which one is more difficult when you walk by bare foot in plane brick road and brick lost road? Explain. 2
c. Determine the applied pressure by the liquid on the 'A' body that mention in the stem. 3
d. Will it be equal buoyancy when the body put in water and glycerin? Analyze mathematically. 4

8. ▶ Mr. Emon feels chest pain, chest flurry and quick heart rate. For this reason when he goes to doctor then the doctor advises him for ECG test.

a. What is the full form of MRI? 1
b. What type of signal used in video conferencing? Explain. 2
c. How to diagnose the disease by the mention experiment in the stem? Explain. . 3
d. Can any other technology used to diagnose the disease that mention in the stem? Give your logic. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Who is the proponent of the experiment Scientific method?
a Kepler
b Roger Bacon
c Dr. Gilbert
d Robert Hook

2. What will be the acceleration when 5N foce is applied on a body of mass 500 gm?
a $0.1\ ms^{-2}$ b $2.5\ ms^{-2}$
c $10\ ms^{-2}$ d $100\ ms^{-2}$

3. Which one is fundamental quantity?
a Heat
b Luminous intensity
c Velocity
d Electric potential

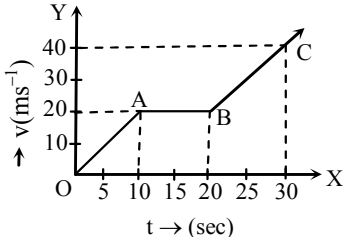
4. Evaporation —
i. is increased when pressure is increased
ii. is a spontaneous process
iii. is maximum rate in vacuum
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

5. What is the power of a concave lens which has focal length of 25 em?
a – 0.04 D b – 0.25 D
c – 2.5 D d – 4 D

6. Which is the unit of stress?
a Nm b Nm^2
c Nm^{-1} d Nm^{-2}

7. By solar energy we can —
i. get fossil fuel
ii. get directly electric energy
iii. drive calculator, pocket radio, electric, watch etc.
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

8. What will be the pressure at a point in a liquid at equilibrium?
a Proportional to depth
b Inversely proportional to depth
c Equal to density
d Inversely proportional to density



Answer the questions no. 9 and 10 by given information.

9. Which part of figure indicates uniform velocity?
a OA b AB
c BC d OB

10. What is the distance the part of AB?
a 20 m b 45 m
c 200 m d 400 m

11. What is the Coulomb's constant in vacuum?
a $9 \times 10^9 Nm^2C^{-2}$
b $9 \times 10^9 Nm^2C^{-1}$
c $9 \times 10^9 Nm^{-1}C^{-2}$
d $9 \times 10^9 Nm^{-1}C^{-1}$

12. If body of charge 10 C is placed at a point in an electric field then it gains electric intensity of 20 NC^{-1}. Find the force of that point.
a 200 N b 20 N
c 2 N d 0.5 N

13. Which one is the dimension of energy?
a MLT^{-1} b MLT^{-2}
c ML^2T^{-1} d ML^2T^{-3}

14. If a body is placed between pole and principal focus of a concave mirror then where the image is form?
a In centre of curvature
b In principal focus
c In front focus
d Behind the mirror

15. The image of convex mirror is —
i. form behind the mirror
ii. real and inverted
iii. always smaller in size
Which one correct??
a i and ii b i and iii
c ii and iii d i, ii and iii

16. Which is the S.I. unit of temperature?
a Kelvin
b Fahrenheit
c Celsius
d Caloric

17. If three resistances of values 2Ω, 1Ω and 2Ω are connected in parallel, then what will be the equivalent resistance?
a 5Ω b 2Ω
c 0.5 Ω d 0.2 Ω

18. How many Neutron are there in carbon $^{14}_{6}C$ isotope?
a 20 b 14
c 8 d 6

19. Which one is correct for step up transformer?
a $l_p > l_s$
b $l_p < l_s$
c $n_p > n_s$
d $E_p > E_s$

20. What is the value of specific heat of copper?
a $2000\ Jkg^{-1}\ K^{-1}$
b $400\ Jkg^{-1}K^{-1}$
c $230\ Jkg^{-1}K^{-1}$
d $130\ Jkg^{-1}K^{-1}$

21. Alpha particle —
i. is a helium nucleus
ii. cannot pass through 6 m thick air
iii. create florescence on zinc sulphide screen
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

22. If a bullet is shot from a gun —
i. momentum will be in the same direction of bullet and gun.
ii. momentum will be of the same value for bullet and gun.
iii. backward velocity of gun will be less than bullet
Which one is correct?
a i and ii
b i and iii
c ii and iii d i, ii and iii

23. What type of semi-conductor will produce by adding born with silicon?
a p-type
b n-type
c p-n-p type
d n-p-n type

Answer the questions no. 24 and 25 on the basis of following information : —
A boy created sound standing near a well of depth 18 m.

24. What maximum height should be reduced so that he can hear echo at 0∅C?
a 34.6 m
b 18 m
c 16.6 m
d 1.4 m

25. What is the time for him to listen echo at 20∅C?
a 0.1 sec
b 0.104 sec
c 0.108 sec
d 1.8 sec

Ans.																												
	1	b	2	c	3	b	4	c	5	d	6	d	7	c	8	a	9	b	10	c	11	a	12	a	13	c
	14	d	15	b	16	a	17	c	18	c	19	a	20	b	21	d	22	c	23	a	24	d	25	b		

43. Jashore Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶

Velocity (ms^{-1})	0	20	40	60	60	60	80	100
Time (sec)	0	10	20	30	40	50	60	70

a. What is called inertia? 1
b. What is the difference between balanced and unbalanced forces? 2
c. With the help of the given data draw a graph. 3
d. Analyze the nature of velocity from given data by mathematical arguments. 4

2. ▶ A body is thrown vertically upward with a velocity of 120 ms^{-1}. Another body of mass 500 gm is also thrown vertically upward after 0.75 second with a velocity of 150 ms^{-1}.

a. What is called the units of measurements? 1
b. Explain the third law of falling bodies. 2
c. Determine the potential energy of second body on maximum height. 3
d. Determine by the mathematical arguments which body fall first on the earth. 4

3. ▶ The distance between source and reflector is 20 m. At that time the temperature of air is 20℃.

a. What is called infrasonic sound? 1
b. Why velocity of sound depend on humidity of air? Explain. 2
c. How long it takes the sound to travel from source to reflector?. 3
d. Give your opinion by the mathematical arguments that the echo will listen or not on 30℃. 4

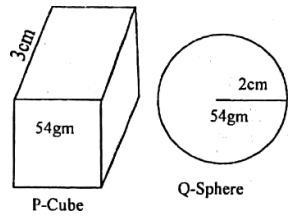
4. ▶ The efficiency of the three motors are 35%, 40% and 45% respectively. The power of every motor is 0.5 KW. The time require to lift water at a height of 20m to a tank in 5 minutes by the first motor.

a. What is called kinetic energy? 1
b. How the kinetic energy of a moving body is related with the velocity? Explain. 2
c. Determine the potential energy of the water when the tank is totally water filled. 3
d. Is there any change of work done when the tank was filled with water by the three motors separately? Explain by logic. 4

5. ▶ A man can't see clearly anybody outside of 60 cm.

a. What is called optical centre? 1
b. How to create perceptions of colored object by cones cell? Explain. 2
c. Determine the power of helping lens for clear sight for the man. 3
d. How to work the helping lens for clear sight for the man? Explain it with ray-diagram. 4

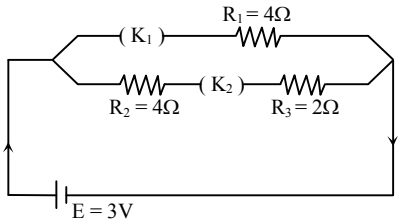
6. ▶



If the objects P and Q are kept separately at the water filled container of R, then it is seen different value of buoyancy.

a. What is called buoyancy? 1
b. Why rotten egg float on water? Explain. 2
c. Determine the density of the object P. 3
d. What is the reason of difference of buoyancy of the objects P and Q though they have the same mass? Explain by mathematical logic. 4

7. ▶



a. What is called electric intensity? 1
b. What is the meaning of specific resistance of silver is $1.6\times10^{-8}\Omega m$? 2
c. Determine the equivalent resistance of the circuit when K_1 and K_2 are closed. 3
d. Is there any difference of power R_1 when both key are closed and only the K_1 is closed? Explain mathematically. 4

8. ▶ 450V, 100 turns and 1-5A current are available in the primary coil. 615A current is available in the secondary coil of a transformer.

a. What is called radioactivity? 1
b. Explain the half life of a radioactive element. 2
c. Determine the electromotive force of the secondary coil. 3
d. Is it possible or not to drive a electric motor which power is 1-5k.W by given transformer? Prove it by the mathematical analysis. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which property of matter does Newton's first law express?
a Force b Inertia
c Acceleration d Velocity

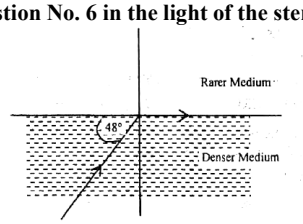
2. 1 Petameter = how much meter?
a 10^9 b 10^{12}
c 10^{15} d 10^{18}

3. Which of the following substance has the highest specific heat?
a Ice b Water vapour
c Copper d Silver

4. What is the refractive index of the substance of optical fiber?
a 1.33 b 150
c 1.70 d 2.25

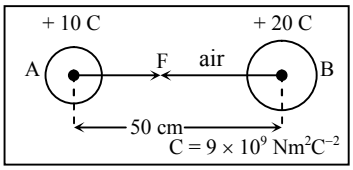
5. Which of the following isotopes is used to treat cancer?
a Carbon-14 b Phosphorus-32
c Cobalt-60 d Iodine-131

Observe the figure and answer the Question No. 6 in the light of the stem:



6. What is the value of critical angle?
a 42Ø b 48Ø
c 90Ø d 132Ø

Answer the Question No. 7 and 8 in the light of following stem :—



7. What is the value of F?
a 7.8×10^8N b 3.6×10^{0}N
c 3.6×10^{12}N d 7.2×10^{12}N

8. For the stem—.
i. if the objects A and B are returned to earlier position by touching each other, F will increase.
ii. if the amount of water vapour is increased at that place, F will increase.
iii. if the product of the charges of the bodies and the distance between them are double, F will remain unchanged.

Which one is correct?
a i b i and ii
c i and iii d i, ii and iii

9. The potential difference between two ends of a dry cell by using voltmenter is found 12V. If a bulb runs by the cell, the flow of charge will be 10C. What is the amount of work done?
a 1.2 J b 2 J
c 22 J d 120 J

Answer the Question No. 10 and 11 according to following information :—
In the following table velocity of a car after every 5 sec is given :

Time(s)	0	5	10	15	20	25	30
Velocity(ms^{-1})	0	20	40	60	60	50	40

10. What is the distance traveled by the car at 10th second in meter?
a 38 b 42
c 162 d 200

11. For car —
i. traveled distance in uniform velocity is 12 m
ii. retardation in last 10s be $2ms^{-2}$
iii. initial momentum be zero
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

12. If the distance of an object from a plane minor is 2m, what will be the distance of the image from the obejct?
a 1m b 2m
c 3m d 4m

13. Which one of the following is correct for specific resistance?
a Copper > Tungsten < Nichrome
b Copper > Tungsten > Nichrome
c Nichrome > Tungsten > Copper
d Tungsten > Nichrome > Copper

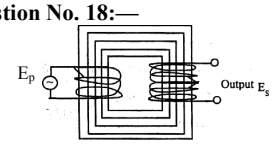
14. 1 kWh = how many Jouls?
a 3.6×10^5 b 3.6×10^6
c 3.6×10^7 d 3.6×10^8

15. The distance between two successive wave crest is 2 cm. What is the distance between one wave crest and next wave trough in cm?
a 2 b 1.5
c 1 d 0.5

16. The focal length of a concave mirror is 10 cm. If an object is placed at the center of curvature of the mirror. What will be the distance of the image?
a 0.08 b 12 cm
c 12.5 d 20 cm

17. Which one of the following is mixed with thorium so that the hands of watch glitter in the dark?
a Ferus sulfide
b Zinc sulfide
c Cuprus sulfide
d Sodium sulfide

Observe the figure and answer the Question No. 18:—



18. For the transformer —
i. $E_s > E_p$
ii. uses are found in industries
ii. $\frac{E_p}{E_s} < \frac{I_p}{I_a}$
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

19. What is the dimension of weight?
a MLT^{-2} b MLT^{-1}
c $ML^{-2}T^{-2}$ d $M^{-1}LT^{-2}$

20. What is the atmospheric pressure per square meter on earth surface?
a 10^4N b 10^5N
c 10^6N d 10^7N

21. For which one of the following is light not reflected internally within the eye?
a Choroid b Iris
c Sclerotic d Cornea

22. If $^a\eta_b = 1.52$ and $\angle i = 60Ø$, $\angle r$ = ?
a 30.73 b 31.73
c 32.73 d 34.73

23. Linear magnification of a mirror is always less than 1. In that mirror image is —
a Real b Erect
c Inverted d Magnified

24. Which one of the following tests does doctor suggest for understanding the kidney artery conditions?
a Angiography
b ETT
c MRI
d Ultrasonography

25. If the intensity of sound is I and amplitude of wave is A, which one is correct?
a $Al = l$ b $A \propto \sqrt{l}$
c $A \propto \frac{l}{\sqrt{I}}$ d $A \propto \frac{-l}{I}$

Ans.																									
	1	b	2	c	3	a	4	c	5	b	6	a	7	d	8	a	9	d	10	d	11	c	12	d	13	c
	14	b	15	c	16	d	17	b	18	b	19	a	20	b	21	a	22	d	23	b	24	a	25	b		

44. Barishal Board-2019

Time-2 Hours 35 Minutes **Creative Essay Type** Mark: 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

1. ▶

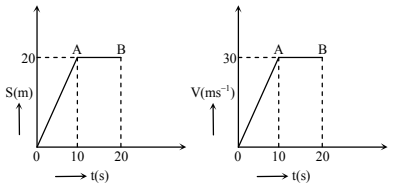


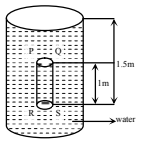
Figure-1 Figure-2

a. What is uniform acceleration? 1
b. The position of an object with respect of a point can be changed without changing its distance—Explain. 2
c. From figure-2, find the distance in 20s. 3
d. From figure-1 and figure-2 give comparative discussion of motion in different parts. 4

2. ▶ Two objects of masses of 8 kg and 4kg were moving along the same straight line. Their velocity was $15ms^{-1}$ and $10ms^{-1}$ respectively. At a moment the first object pushed the second object. As a result, the velocity of first object was $10ms^{-1}$.

a. What is the balanced force? 1
b. Action and reaction force acts always on different objects. — Explain. 2
c. Find the impulse of force of the first object. 3
d. Will the kinetic energy be conserved in case of two objects? Give your opinion with mathematical logic. 4

3. ▶ Notice the picture below and answer the related questions: —



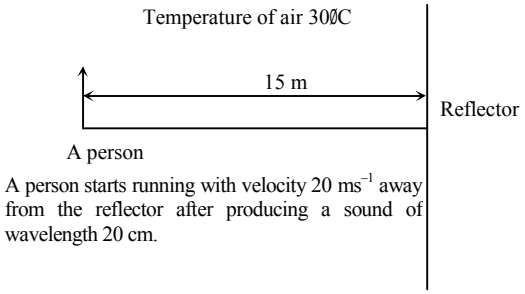
Area of surface PQ of the cylinder = $1.5m^2$, the water density = $1000kgm^{-3}$, g = $9.8ms^{-2}$.

a. What is the buoyancy? 1
b. The density of matter depends on the temperature. Explain. 2
c. What is the downward force by the liquid on the upper surface of the cylinder? 3
d. The upward resultant force is equal to the weight of the displaced water.—Analyze it mathematically. 4

4. ▶ There is 500 gm water of temperature 90℃ in a Copper container of mass 400 gm. A solid sphere of mass 500 gm of diameter 100 mm of temperature 30℃ is dipped into the container. The specific heat of Copper is 400 $Jkg^{-1}K^{-1}$. The specific heat of element of sphere is 200 $Jkg^{-1}K^{-1}$, and coefficient of linear expansion of element of sphere is $19\times10^{-5}K^{-1}$. Specific heat of water of 4200 $Jkg^{-1}K^{-1}$.

a. What is latent heat? 1
b. Why does a fan turn on to dry a wet floor? Explain. 2
c. Find the final temperature of the mixture? 3
d. Is it possible to enter the sphere at final temperature of the mixture through a ring of radius 100.5 mm? Analyze it. 4

5. ▶



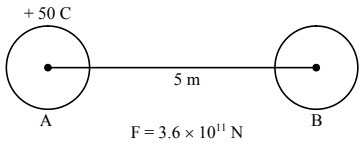
A person starts running with velocity 20 ms^{-1} away from the reflector after producing a sound of wavelength 20 cm.

a. What is intensity of sound? 1
b. The particles of transverse wave are in periodic motion.— Explain. 2
c. Find out the time period of sound wave? 3
d. Does the person 'A' hear the echo? Give your argument with mathematical explanation. 4

6. ▶ The focal length of a convex lens is 20 cm. If an object is placed in front the lens at fixed distance then an image is formed on the other side at 100 cm.

a. What is principal focus of lens? 1
b. How do we see the objects placed in different distances standing at same place? Explain. 2
c. Find the distance of object from optical centre. 3
d. Is it possible to form image at the same side of object by changing the position of object? Demonstrate with the help of figure. 4

7. ▶



A and B are identical in size and in element. C = $9 \times 10^9 Nm^2C^{-2}$.

a. What is electric lines of force? 1
b. Explain the reason to create a neutral point between two same charges. 2
c. Calculate the electric intensity at the point of 'B' due to 'A'. 3
d. If 'A' and 'B' are connected by a conduction wire then in which direction electron will flow? Analyze it. 4

8. ▶ Toma goes to doctor due to pain at abdomen. Doctor thinks that stone is formed at gallbladder. To confirm, doctor advises her to go to a diagnosis centre. The diagnosis centre told her that there is a X-ray machine drived by 30000V and a high qualified ultra-sonography machine, you could indentify your problem by the both machines. (Charge of electron is $1.60\times10^{-19}C$).

a. What is radio activity? 1
b. What do you mean by the power of a power station is 1000 megawatt? 2
c. How much energy will be gained by a electron when it comes out in the X-ray machine? Calculate it. 3
d. Which machine is more safe to diagnose Toma's problem? Represent you opinion in view of production technique. 4

Time — 25 minutes

Creative Multiple Choice

Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark.]

1. Which one is the unit of potential difference?
a Ampere b Coulomb
c Volt d Ohm

2. Nishat Majumder climbed up a mountain of height 850 m with goods of mass 10 kg. Her own mass is 55 kg. What is the work done by her?
a 5.4×10^5 J b 4.6×10^5 J
c 5.5×10^4 J d 8.3×10^4 J

3. Which one of the following is a derived quantity?
a Electric current
b Luminous intensity
c Power d Temperature

4. If an object is immersed in a liquid at equilibrium the weight it attains is —
a Equal to the difference of upward force and downward force
b Equal to the upward force
c Equal to the weight of the displaced liquid
d Equal to the difference of the weight of the object and the buoyancy

Answer the questions no. 5 and 6 on the basis of the diagram :

A force of 22 N was applied on an object of mass 10 kg for 10 seconds. The frictional force of the surface on which the object was moving was 2N.

5. What will be the velocity of the object after 10 seconds?
a 12 ms^{-1} b 22 ms^{-1}
c 22 ms^{-1} d 24 ms^{-1}

6. According to the above information which one is correct?
a The kinetic energy of the object will decrease with time
b The distance travelled in the first 5s is equal to the distance travelled in the next 5s
c The effective force on the object is 24 N
d The impulse of force, is equal to the final momentum of the object

7. For which position of the object the image produced in a cohcave mirror cannot be projected on a screen?
a Between P and F
b Between F and C
c Between C and infinity
d At infinity

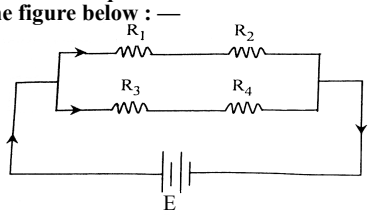
8. Into what type of energy does the speaker convert the electrical signal of the microphone?
a Electrical energy
b Electromagnetic energy
c Magnetic energy
d Sound energy

9. The dimension of which pair of quantities are different?
a Speed, Velocity
b Acceleration, Retardation
c Work, Power d Force, Weight

10. Which test is done to detect cardiac problem and tumour?
a CT scan b MRI
c Ultrasonogram d ECG

11. In case of latent heat object's —
i. temperature changes
ii. state changes
iii. internalenergy decreases
Which one is correct?
a i b ii
c i and iii d ii and iii

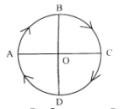
Answer the questions no. 12 and 13 from the figure below : —



12. What is the equivalent resistance of the circuit?
a $6R_1$ b $2R_1$
c $3R_{21}$ d $3R_{22}$

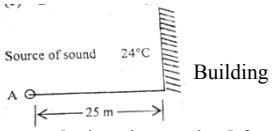
13. In the above circuit —
i. The flow of current through R_1 and R_4 are the same
ii. The potential difference of R_2 and R_3 are the same
iii. The power of R_2 and R_4 are the same
Which one is correct?
a ii b iii
c i and ii d i and iii

14.



Having started from the point A you arrived at the point A again along the path ABCD. At which point your displacement is the maximum?
a D b C
c B d A

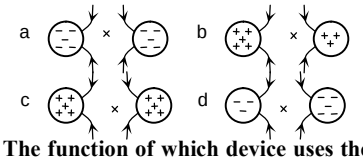
15.



How much time is required for the sound to come back to the point A?
a 0.144 s b 0.151 s
c 0.072 s d 0.075 s

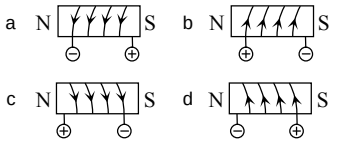
16. Which one of the following of equal volume has more mass?
a Iron b Gold
c Mercury d Silver

17. Which one of the following figures is correct?



18. The function of which device uses the Electromagnetic Induction?
a Generator b Motor
c Calling bell
d Earpiece of Telephone

19. Which one of the following figures is correct?



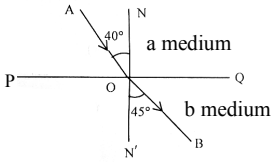
20. What will happen if a drum rolls down along an inclined road?
a The rate of change of momentum will remain constant
b There will be no frictional force
c The acceleration will increase continuously
d Force will decrease continuously

21. The potential energy of which of the following substance is zero?
a Water b Mercury
c Iron d Carbon dioxide
Note: Question is logically incorrect.

22. Where the value if g is the maximum?
a Equatorial region
b Polar region
c Sea level d Tropical region

23. What type of energy is stored in a spring when it is kept stretched?
a Kinetic energy b Heat energy
c Potential energy d Chemical energy

Answer the questions no. 24 and 25 according to the figure below :



24. What is the value of $^b\eta_a$?
a 1.125 b 1.100
c 0.909 d 0.889

25. According to the figure —
i. $\eta_a > \eta_b$
ii. $C_a > C_b$ iii. $\theta_a = 65.37^\circ$
Which one is correct?
a i b ii
c i and iii d ii and iii

Ans.																										
	1	c	2	a	3	c	4	d	5	b	6	d	7	a	8	d	9	c	10	c	11	b	12	c	13	d
	14	b	15	a	16	b	17	a	18	a	19	d	20	a	21	*	22	b	23	c	24	b	25	c		

45. All Board 2018

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

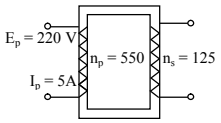
1. ▶ A car starts from rest with constant acceleration of $2m/sec^2$ for 6 sec. After that it moves with constant speed for 1 min.

a. What is deceleration? 1
b. Show that force is a derived-quantity. 2
c. Calculate the distance travelled with constant acceleration. 3
d. If the car travelled the whole distance mentioned in the above path with constant acceleration $2m/sec^2$, what would be the total time? 4

2. ▶ An object of 250 gm. has been thrown upward in the vertical direction with the initial velocity 49m/sec.

a. What is efficiency? 1
b. How can Geo-thermal energy be used? Explain it. 2
c. How long time it will expend to reach the highest point? 3
d. Show that the initial total energy is equal to the total energy at the highest point. 4

3. ▶

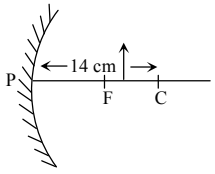


a. What is electromagnetic induction? 1
b. "p-n junction works as a rectifier". Explain. 2
c. Calculate the voltage of secondary coil? 3
d. From the stem, mathematically show that the total power in the primary coil is equal to that of the secondary coil. 4

4. ▶ One day Rony and Johny was standing in front of a hill. Johny shot a bullet with the gun in his hand. Though Johny couldn't heard the echo Rony easily heard it after 0.1005 sec staying behind 1 meter. The temperature of air on that day was 25 °C.

a. What is Amplitude? 1
b. Why sound can be heard faster in the rainy season than in winter? 2
c. Determine the distance between Rony and the hill. 3
d. Find the minimum temperature in which Johny could heard the echo? Analyze mathematically. 4

5. ▶



The distance of the object is 10 cm in the figure.

a. What is optical fibre? 1
b. What do you understand by the power of lens is 3D? 2
c. Calculate the distance of the image. 3
d. If the object is placed at 5 cm distance in front of the miror, analyze the position, size and nature of the image by ray diagram. 4

6. ▶ The area and height of a rectangular object is $24cm^2$ and 3cm respectively. The weight of the object is 1.4N when it is merged in kerosene. The density of kerosene is $800kg/m^3$.

a. What is buyonancy? 1
b. Why is it easy to swim in the sea than in the river? 2
c. Determine the density of the object. 3
d. Analyze mathematically whether the given information follow the Archimedes principle. 4

7. ▶ A solid object of mass 3 kg and temperature 15°C is placed beside a burning oven with temperature 200°C. So, the temperature of the object rises to 86°F after a certain period. Specific heat of the object is $361kg^{-1}k^{-1}$. The latent heat of the ice is 336000 Jkg^{-1}.

a. What is specific heat? 1
b. What is meant by coefficient of linear expansion of steel is $11 \times 10^{-6}k^{-1}$? 2
c. How much heat absorbed by the object to rise the temperature at 86°F? 3
d. If the object is placed in 500gm ice cool water what will be the highest temperature of the mixture? Analyze mathematically. 4

8. ▶

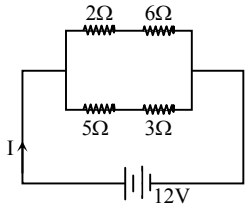


Fig-1

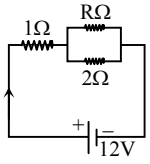


Fig-2

a. What is electric induction? 1
b. Why the potential of earth is taken as zero? 2
c. Determine the current in fig-1. 3
d. In fig-2 what will be the value of resistance R to produce double current than that of fig-1. 4

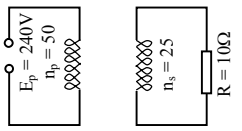
Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.–** Candidates are asked not to leave any mark or spot on the question paper.]

1. Electric lines of force is used to explain the direction of which of the following?
a Electric field b Electric intensity
c Electric potential
d Electric induction

2. Which of the following is non-conservative force?
a Frictional force
b Electric force
c Gravitational force
d Magnetic force

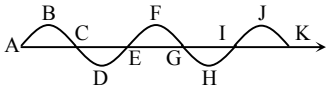
3.



How much ampere of electricity will flow through the load (R) of the transformer?
a 12 b 24
c 48 d 120

A diagram of a transverse wave is given below.

Answer the questions no. 4 and 5 on the basis of the diagram :



4. Which of the following points are in same phase?
a A, B, C b A, C, E
c B, D, F d A, E, I

5. The correct relation is —
i. $\lambda = CE$
ii. $2\lambda = AI$
iii. $\frac{3}{2}\lambda = CI$

Which one of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

6. All the distances of the lens are measured from —
a optical centre
b centre of curvature
c principal focus
d surface

7. From the integrated use of main scale and the Vernier scale, the net reading is 12.66 cm. If the vernier coincidence with the main scale is 6, what is the value of Vernier constant? [Given that the main scale reading is 12.6 cm]
a 0.1 mm b 0.01mm
c 0.5 mm d 0.05 mm

8. Which of the following is the theermometric property of a mercury throm meter?
a Pressure b Length
c Density d Resistance

9. What is the radius of the cylinder which is used as the standard of 'kilogram' in measuring the SI unit of mass?
a 1 cm b 1.95 cm
c 3.3 cm d 3.9 cm

10. Which of the following is used for more developed types of periscope in a submarine?
a Convex lens b Plane mirror
c LED d Prism

11. ML^2T^{-3} is the dimension of —
i. Work done per unit time
ii. Power
iii. Energy used per unit time
Which one of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

12. IF the absolute refractive index of a medium is $\sqrt{2}$, what is the critical angle of that medium with respect to air?
a 60° b 45°
c 30° d 24°

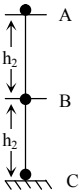
13. Which one is used in three-pin plugs?
a Circuit breaker b Switch
c Fuse d Earth wire

14. The correct relation is —
i. $\sigma = \frac{1}{\rho}$
ii. $G = \frac{1}{R}$ iii. $\sigma = G\frac{L}{A}$
Which one of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

15. What is the 'p' section in the n-p-n transistor?
a Collector b Emitter
c Base d Amplifier

16. What is the velocity of alpha-ray in ms^{-1}?
a 3×10^5 b 3×10^6
c 3×10^7 d 3×10^8

Observe the figure below and answer the questions on. 17 and 18 :



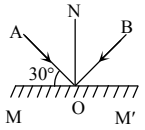
17. What is the potential energy of the body at point B?
a mgh_1 b mgh_2
c $mg(h_1 + h_2)$ d $mg(h_1 - h_2)$

18. While falling freely at which height the kinetic energy of the object will be three times of the potential energy?
a $\frac{h_1}{4}$ b $\frac{h_2}{3}$
c $\frac{h_1 + h_2}{3}$ d $\frac{h_1 + h_2}{4}$

19. In which Muslim Scientist's book, the reference of the Windmill is found?
a Al-Masudi
b Ibne-Al-Haitham
c Al-Hazen
d Abdus Salam

20. What will be the stress if a weight of 98 N is hung in a wire of diameter 1 mm?
a $1.25 \times 10^{10} Nm^{-2}$ b $1.25 \times 10^8 Nm^{-2}$
c $1.2 \times 10^8 Nm^{-2}$ d $1.2 \times 10^6 Nm^{-2}$

21.



What is the angle of reflection in the above figure?
a 30° b 45°
c 60° d 90°

22. If a force of 30N is applied to an object of mass 8kg which is kept on a surface, it achieves an acceleration of $3ms^{-2}$. What is the frictional force in Newton between the object and the surface?
a 0 b 6
c 24
d 54

23. Which one is necessary to detect a recent heart attack?
a ECG
b CT Scan
c ETT
d Angiography

24. What is the dimension of *ut* in the equation, $S = ut = \frac{1}{2}at^2$?
a LT^{-3} b LT^{-2}
c L d 0

25. Which of the following is better during thunder storm?
a To stay under an umbrella
b To stay under a tree
c To stay under an electric pole
d Getting wet in rain

Ans.																										
	1	a	2	a	3	a	4	d	5	c	6	a	7	d	8	b	9	b	10	d	11	c	12	b	13	d
	14	b	15	c	16	c	17	b	18	c	19	a	20	b	21	c	22	b	23	c	24	c	25	d		

46. Dhaka Board 2017

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Answer any five Questions.]

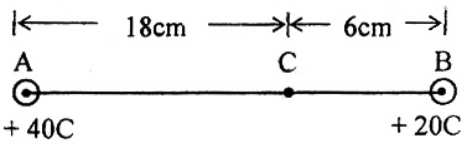
1. ▶ A deer of mass 80kg is running with uniform velocity 72kmh^{-1}. In the mean time a tiger of mass 200kg which was hiding behind a tree started chasing the deer from 75m behind with uniform acceleration 1.5ms^{-2} for 30s.

a. What is inertia? 1
b. What do you understand by 50N force? 2
c. Find the kinetic energy of the tiger after 10s. 3
d. Is it possible for the tiger to catch the deer? Give your opinion with mathematical analysis. 4

2. ▶ The depth of a well is 3500cm, air temperature is 60°F. At this temperature the velocity of sound is 343ms^{-1}.

a. What is wave velocity? 1
b. Set the relationship between frequency and time period. 2
c. What is the temperature of that place in celcius scale? 3
d. If any sound is produced at the mouth of the well, will echo be heard? Explain mathematically. 4

3. ▶



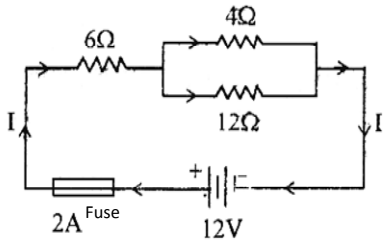
Charges A and B are placed in air medium.

a. What is electric potential? 1
b. 220V−60W is written in an electric bulb. Explain the meaning. 2
c. Find out the amount of force acting between the charges A and B. 3
d. If a unit positive charge ius placed at the point C, for which charge the intensity at C will be greater? Explain mathematically. 4

4. ▶ The weight of an object of area 20cm^2 and height 10cm in air and water is 9.8N and 7.84N respectively. Here g = 9.8ms^{-2}.

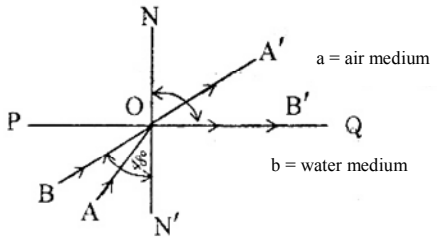
a. State Archimedes' law. 1
b. Write down the conditions of floatation and immersion of a body. 2
c. Calculate the density of the material of the object. 3
d. Does the stem follow Archimedes' law? Give mathematical explanation. 4

5. ▶



a. What is an electric circuit? 1
b. How can 'System Loss' be reduced? 2
c. Find out the equivalent resistance of the circuit. 3
d. If all the resistances in the stem are connected in parallel, will the fuse be burnt for the produced electricity? Analyze mathematically. 4

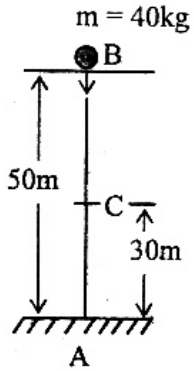
6. ▶



Heare, ∠BON′ = 48°, ∠B′ON = 90° and $C_a = 3\times10^8$ms^{-1}.

a. What is reflection of light? 1
b. When total internal reflection will take place? Explain. 2
c. Calculate the velocity of light in 'b' medium. 3
d. If air medium in the stem is replaced with glass medium, is it possible to find total internal reflection? Analyze drawing required figure. 4

7. ▶



a. What is kinetic energy? 1
b. When we throw an arrow by stretching the string of a bow, how does the energy transformation take place? 2
c. Determine at which velocity the object will hit the ground?3
d. If the object is dropped freely from the point B, the object follow the conservation of energy.− Explain mathematically. 4

8. ▶ The ratio of the number of turns of the primary and secondary coil of a transformer is 1 : 50. The electric current and voltage of the primary coil is 5A and 220V respectively.

a. What is solenoid? 1
b. Why motor is called the opposite instrument of generator?2
c. Find $E_p : E_s$ according to the stem. 3
d. From the stem mathematically show that the electric power of the primary and secondary coil of the transformer remains constant. 4

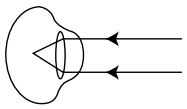
Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

1. From which Newton's Laws of motion force can be measured?
a First law b Second law
c Third law d First and Third law

2. Condition of total internal reflection is —
i. Light rays pass from denser to rarer medium
ii. Incident angle > Critical angle
iii. Incident angle = Reflection angle
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

3.



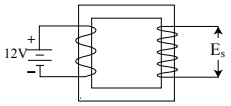
What kind of defect of eye is indicated in the above figure?
a Myopia b Nightblindness
c Retinal detachment
d Hypermetropia

4. If mass, specific heat and thermal capacity of a body are m, S and C respectively, then which of the following relation is correct?
a $C = \frac{S}{m}$ b $S = \frac{m}{C}$
c $S = Cm$ d $S = \frac{C}{m}$

5. Density of water is the highest at which of the following temperature?
a 4 K b 273 K
c 277 K d 278 K

6. The length of a steel wire at 20°C is 100m. If the length of the wire at 50°C is 100-033m what is the co-efficient of linear expansion of steel?
a $11\times10^{-6}K^{-1}$ b $22\times10^{-6}K^{-1}$
c $33\times10^{-6}K^{-1}$ d $44\times10^{-6}K^{-1}$

7.



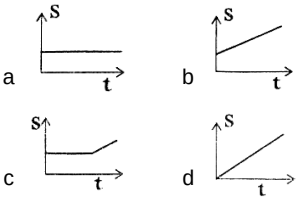
In the above figure $n_p = 10$, $n_s = 50$. What is the value of E_s?
a 0 volt b 12 volt
c 50 volt d 60 volt

8. Which of the following in an address of rahim43@yahoo.com?
a Fax address b Internet address
c E-mail address d G-mail address

9. Which of the following two scientists invented that "nucleus is fissionable"?
a Otto Henn and Stresemann
b Neill Bohr and Ernest Rutherford
c Pierre Curie and Madam Curie
d Max Planck and Albert Einstein

10. Which of the following is measured by spring balance?
a Mass
b Acceleration due to gravity
c Force of gravity d Force of friction

11. Which of the following graphs indicates uniform velocity?

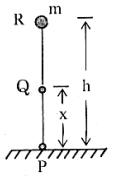


12. If constant force is applied on a body —
i. When mass is less acceleration is greater
ii. When mass is less acceleration is also less
iii. When mass is greater then acceleration will be less
Which one is correct?
a ii b i and ii
c i and iii d ii and iii

13. 54 kmh^{-1} equals to which of the following?
a 12 ms^{-1} b 15 ms^{-1}
c 20 ms^{-1} d 25 ms^{-1}

14. Mass of a body is 2kg and initial velocity is 5 ms^{-1}. After 3s velocity of body becomes 8 ms^{-1}, then what amount of force is applied on the body?
a 1 N b 2 N
c 3 N d 4 N

From the figure below, anser the question no. 15 and 16: —



15. What will be the Kinetic energy of the freely falling body at point Q if it falls from R?
a 0 b mgx
c mgh
d mg(h–x)

16. In case of a free falling body from point R —
i. The body will gain velocity
ii. The Kinetic energy will be transformed into potential energy
iii. Velocity will increase as distance increases
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

17. An electric motor lifts a body of mass 2 kg by 5m and consumed 107J of energy. What amount of energy is wasted by the motor?
a 6J b 9J
c 10J d 49J

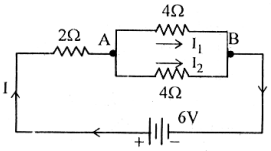
18. NC^{-1} is the unit of which of the following?
a Electric power
b Intensity of sound
c Pitch of sound
d Electric Intensity

19. What is the refractive index of the layer of optical fiber?
a 1.50 b 1.55
c 1.70 d 1.77

20. How many alphabets will not change when an image of the word "EXAMINATION" is seen in a plane mirror?
a 5 b 7
c 8 d 9

21. What is the dimension of energy?
a MLT^{-2} b MLT^{2}
c $ML^{-2}T^{2}$ d $ML^{2}T^{-2}$

Answer question no. 22 and 23 on the basis of the stem below: —



22. What is voltage between point A and B?
a 2 V b 3 V
c 4 V d 6 V

23. In case of current flowing in the circuit of above stem —
i. $I = I_1 = I_2$ ii. $I_1 = I_2$
iii. $I > I_2$
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

24. Melting point of which of the following matter increases as pressure increase?
a Ice b Cast Iron
c Wax d Antimony

25. Three dimensional image of different organs of human body can be generated by which of the following?
a CT Scan b X-Ray
c ECG
d Angiography

Ans.	1	b	2	a	3	a	4	d	5	c	6	a	7	c	8	d	9	a	10	c	11	d	12	c	13	b
	14	b	15	d	16	b	17	b	18	d	19	a	20	c	21	d	22	b	23	d	24	c	25	a		

47. Rajshahi Board 2017

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶

Velocity (ms^{-1})	0	10	20	30	40	50	60
Time(s)	0	4	8	12	16	20	24

a. What is called dimension? 1
b. Explain why weight of a body3 varies at different places of the earth. 2
c. Find our the distance travelled at 6th second in the light of information of the stem. 3
d. Draw the graph in the light of given information and find out the slope of the graph. 4

2. ▶ The weight of a body of a volume $400cm^3$ in air is 19.6N. If it is immersed in water, its weight becomes 15.68N. At experimental place acceleration due to gravity $g = 9.8ms^{-2}$.

a. What is called buoyancy? 1
b. At definite depth the pressure depends on the nature of liquid.− Explain it. 2
c. Find out the density of the body of the stem. 3
d. Does the above stem support Archimedes' Principle? Give opinion through mathematical analysis. 4

3. ▶

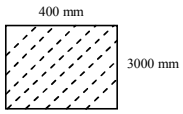
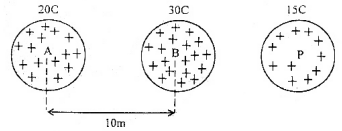


Figure : Metal piece

The surface area of the figure is increased by $0.1m^2$ for the rise of temperature 30°C

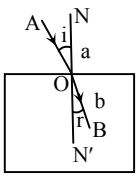
a. What is regelation? 1
b. Explain the plasma state of matter. 2
c. Find out the co-efficient of linear expansion of the metal piece. 3
d. What will be the increase in temperature to increase the surface area of that metal 6%? 4

4. ▶



a. What is called P−n junction? 1
b. Explain how we can perceive the colour of coloured object. 2
c. Find out the force between the charges A and B. 3
[Here constant $C = 9\times10^9 Nm^2C^{-2}$]
d. At what position between the charges A and B is the charge P placed so that there is no effect of charges A and B on charge P? 4
Give your opinion through mathematical analysis.

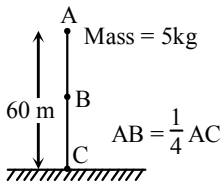
5. ▶



The velocity of light decreased by one-third as light entered into the medium b from medium a. Velocity of light in medium a is $3 \times 10^8 ms^{-1}$.

a. What is called refractive index? 1
b. Explain the advantage of having two eyes. 2
c. Find out the value of incident angle if the angle of refraction is 35°. 3
d. If the angle of refraction is increased by 5° without changing the value of incident angle, what will be the change of the velocity of light in medium b? Give opinion with mathematical logic. 4

6. ▶



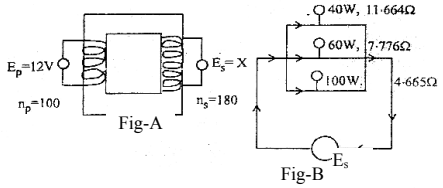
The body is dropped from the position A freely.

a. What is called potential energy? 1
b. Explain why biomass can be considered as a multiple source of energy. 2
c. If the time to lift the body at position A from the ground be 2 minutes, what power is used? 3
d. Does the law of conservation of energy follow at position B and C in above stem? Evaluate mathematically. 4

7. ▶ The frequencies of sounds produced from two different sources in medium P are 340Hz and 400 Hz and the difference of their wavelengths is 0.165 m. In another medium Q the velocity of sound is $400ms^{-1}$.

a. What is called contact force? 1
b. Explain the relation between the velocity of sound with the nature of medium. 2
c. Find out the velocity of sound in medium? 3
d. If the difference of wavelength of same sound in both media is 0.1m, then will the wave travel the distance 124 m in medium Q by 80 complete vibrations? Give opinion through mathematical analysis. 4

8. ▶



a. Write elaboration of ECG. 1
b. Why is electric current reduced for transmission of electricity over long distances? 2
c. Find the value of X from figure : A. 3
d. If all bulbs run at a time with the obtained value of X in figure : B, is it possible to get the maximum light? Give your opinion through mathematical analysis. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

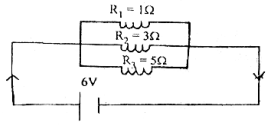
[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.–** Candidates are asked not to leave any mark or spot on the question paper.]

1. Which is the correct relationship?
a $\alpha = 2\beta = \gamma$ b $2\alpha = \beta = \gamma$
c $2\alpha = 3\beta = \gamma$ d $6\alpha = 3\beta = \gamma$

2. Which one of the following is a scalar quantity?
a Force b Acceleration
c Velocity d Work

3. Small particles of ink of a inkjet printer are —
i. positively charged
ii. attracted by positive plate
iii. moving through two plates
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

Observe the following circuit and anser the questions no. 4 and 5:



4. What is the value of electric current in A?
a 0.67 b 3.9
c 9.2 d 57.5

5. Which one of the following combination of the resistance the flow of current will be minimum? 9+ mean series combination and || mean parallel combination)
a $R_1 + (R_2 \parallel R_3)$ b $R_2 + (R_1 \parallel R_3)$
c $R_3 + (R_1 \parallel R_2)$ d $R_1 \parallel R_2 \parallel R_3$

6. What is the specific heat of water vapor in $Jkg^{-1}K^{-1}$?
a 400 b 2000
c 2100 d 4200

7. How much meter is equal to 10 fremtometer?
a 10^{-12} b 10^{-13}
c 10^{-14} d 10^{-15}

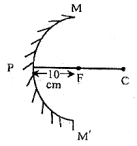
8. Which one is added with silicon in p-type semiconductor?
a Boron b Phosphorus
c Antimony d Arsenic

9. Inertia —
i. is a natural phenomena
ii. requires force to have a change
iii. is determined by weight
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

10. Which one is the dimension of power?
a ML^2T^2 b MLT^{-1}
c ML^2T^{-2} d ML^2T^{-3}

11. How can you find out the magnitude of charge?
a Dividing force by electric intensity
b Dividing electric intensity by force
c Multiplying force by electric intensity
d Multiplying electric intensity by the square root of force

12.



Which is the value of radius of curvature or mirror?
a 20 m b 10 m
c 20 cm d 10 cm

13. Which instrument is used to compare with a slice of bread to obtained image?
a CT Scan b MRI
c ECG d X-ray

14. If a runner of 60 kg passes 100m distance within 12.5 sec, how many kinetic energy in joule will be?
a 240 b 480
c 1920 d 3840

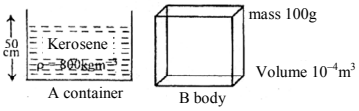
15. Intensity of magnetic field of a solenoid depends on —
i. electric current
ii. the no. of turns of solenoid
iii. The direction of electric current
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

16. What type of image is produced in mirror in case of dental treatment?
a Real and extended
b Virtual and extended
c Real and little in size
d Virtual and little in size

17. Which one is the colour sensitive?
a Retina b Lens of eye
c Rods d Cones

18. What is the function of rectifier?
a Increase the electric current
b Increase the voltage
c Decrease the electric current
d Turn one way the electric current

Answer the questions no. 19 and 20 on the basis of the following stem:



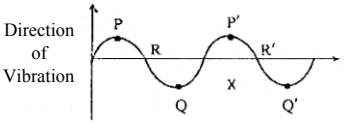
19. How much pressure in Pascal will be felt at the bottom of the container 'A'?
a 3.92×10^{6} b 3.92×10^{4}
c 3.92×10^{3} d 3.92×10^{-4}

20. What will happen if 'B' body is kept in 'A' container?
a will sink down
b will partially immersed
c will float
d will float freely just below the surface

21. Who is the inventor of the wind pump?
a Romer
b Von Guericke
c Huygen
d Robert Hooke

22. What type of friction is the motion of bicycle?
a Static friction b Sliding friction
c Rolling friction d Fluid friction

23.



Which one indicates wave length?
a PR b PQ
c P'Q' d PP'

24. What is called the rectangular coil of wire on the soft sheet of iron in generator?
a Slip ring b Armature
c Solenoid d commutator

25. The velocity of a car decreases at a uniform rate from $20ms^{-1}$ to $4ms^{-1}$ in 4 sec.
What is the acceleration of the car in ms^{-2}?
a 16 b 4
c – 4 d – 16

Ans.																										
	1	d	2	d	3	b	4	c	5	c	6	b	7	c	8	a	9	a	10	d	11	a	12	c	13	b
	14	c	15	a	16	b	17	d	18	d	19	c	20	a	21	b	22	c	23	d	24	b	25	c		

48. Dinajpur Board 2017

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ A toy car of mass 250gm is generated by an engine of 5J energy, at 1st trail its continues with $4ms^{-1}$ uniform velocity and in the 2nd trail it starts from rest with uniform acceleration $1ms^{-2}$ and travels 8m distance.

a. What is 1 Joule? 1

b. Why it is difficult to open a water tap having screw like turns with wet soapy hand? Explain. 2

c. Determine the required time to travel the distance in the 2nd trail mentioned in the above stem. 3

d. Is there any change of efficiency of the toy car in the both trails? Explain with mathematical logic. 4

2. ▶ A water vessel of mass 300kg having volume 900 m^3 floats on water, while 2.94×10^6N buoyancy acts on it. It is tried to use the water vessel as a completely immersed submarine by keeping its shape unchanged.

a. What is buoyancy? 1

b. What is the reason of variation of the pressure at a point in a specific liquid at a fixed depth? 2

c. How many portion of volume of the water vessel is immersed, when it floats on water? 3

d. To be succeed in the last step what kind of change should be taken? Explain with mathematical logic. 4

3. ▶ 24000J heat is applied to increase the temperature of a rod of length 1m having mass 3kg from 30°C to 50°C, whose expansion of length is 2.34×10^{-4}m. The expansion of length of another simillar rod is 2.2×10^{-4}m for the same change of temperature.

a. What is the unit of thermal capacity? 1

b. Explain the effect of pressure on the melting point. 2

c. Find the specific heat of the 1st rod. 3

d. What is the reason for the different value of linear expansion of these two rods? Explain with mathematical logical. 4

4. ▶ A dentist uses a spherical mirror 'X' of focal length 6cm. And a driver uses another spherical mirror 'Y' of focal length 60cm where the distance of the image of the another car is − 50cm.

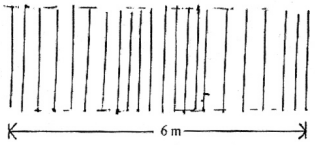
a. What is optical centre? 1

b. What is meant by power of lens − 0.25D? 2

c. What was distance of the car is seen in the mirror 'Y'? 3

d. If the dentist placed the mirror 'X' at 4cm and 8cm away from teeth then which position of the mirror will be more effective? explain with the help of ray diagram. 4

5. ▶ The frequency of a sound wave produced by a source is 86Hz whose speed is different in water and air. Speed of this wave in water is $1450ms^{-1}$ and the figure of vibration in air is given below−



a. What is phase? 1

b. What is meant by intensity of sound $25Wm^{-2}$? 2

c. Find the time period of the wave in water. 3

d. Why the speed of the sound wave is different in those two mediums mentioned in the stem? Explain mathematically. 4

6. ▶ A and B are two charged body and C is a neutral body. The charge of A and B are −5C and +10C respectively. The electric intensity of a point 'X' is 2 NC^{-1} for B which is nearer to A.

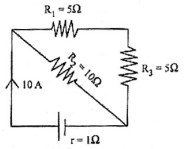
a. What is electric energy? 1

b. Within resistance and resistivity which term is dependent on the physical state? 2

c. Find the force on point 'X' applied by B. 3

d. Is it possible to convert object C into a negatively charged object by the object A and B due to induction? Explain with logic. 4

7. ▶ Flow the figure and answer to the Questions :−



a. What is the relation between electric intensity and electric lines of force? 1

b. What is the character of induced charge and inducing charge? Explain. 2

c. Determine the difference between E and V. (Where E and V represents usual symbol.) 3

d. Is it possible to get double electric current by rearranging the resistors? Explain with mathematical logic. 4

8. ▶ Rony lifted up a flag of mass 200gm appling IN force at a height of 10m which was tied with a string by the help of pulley. Secondly he released an object of mass 1kg tieing it at the other end of the string from a height of 2m and become success to lift up the flag at the same height. Rony takes 5 second to lift up the flag.

a. What is uniform acceleration? 1

b. What will be the graph of uniform acceleration in (v-t) graph? Explain. 2

c. Determine the power of Rony to lift up the flag. 3

d. Will the 2nd process follow the law of conservation of energy? Explain mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.–** Candidates are asked not to leave any mark or spot on the question paper.]

1. If i and θc are represented as incident angle and critical angle respectively then which one of the following is the condition of total internal reflection?
a $i \leq \theta c$ b $i > \theta c$
c $i < \theta c$ d $i = \theta c$

2. If the resistance of a wire is 5Ω then what will be the conductance?
a $0.1\Omega^{-1}$
b $0.2\text{m}\Omega^{-1}$
c $0.2\Omega^{-1}$
d $4\Omega^{-1}$

3. Which one is semi-conductor?
a Cacsium b Germanium
c Glass d Plastic

4. On which part of photo copier machine the reflected light ray converges, which inclidents from the white part of the machine?
a Drum b Toner
c Glass d Carbon powder

5. The speed of which ray of the following is $3\times10^8 ms^{-1}$?
a Alpha b Beta
c Gamma d X-ray

6. Which mirror is used for security purpose of the shopping mall?
a Plane mirror b Concave mirror
c Convex Mirror d Spherical mirror

7. What is the power of a convex lens of focal length 50 cm?
a – 2D b – 0.2D
c 0.2D d 2D

8. What is *npn*?
a Diode b Triode
c Rectifier d Transistor

9. The number of turns of primary and secondary coil of a transformer are 10 and 75 respectively. If the current of primary coil is 5*A* then what will be the current of secondary coil in the ampere?
a 0.67 b 0.69
c 0.73 d 37.5

10. What is the refractive index of the element of the optical fibre?
a 0.75 b 1.33
c 1.5 d 1.7

11. What is the resistivity of Tungsten?
a $1.7\times10^{-8}\Omega m$ b $1.6\times10^{-8}\Omega m$
c $5.5\times10^{-8}\Omega m$ d $100\times10^{-8}\Omega m$

12. The reasons of Myopia are —
i. the converging power of the eye lens increases
ii. the radius of the eye ball decrease
iii. the focal length of the eye lens decreases
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

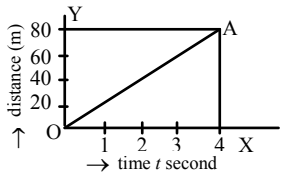
13. Which one of the following is the equation of volume of a cylinder having diameter *'d'* and height *'h'*?
a $\pi d^2 h$ b $\frac{1}{4}\pi dh$
c $\frac{1}{4}\pi d^2 h$ d $\frac{1}{6}\pi d^2 h$

14. The density of which substance is more?
a Water b Ice
c Glycerine d Kerosene

15. How many optical centre are there is a lens?
a One b Two
c Three d Four

16. What is the normal temperature of human body in Kelvin scale?
a 36.89K b 98.4K
c 136.89K d 309.89K

Answer to the following question no. 17 and 18 according to the figure:

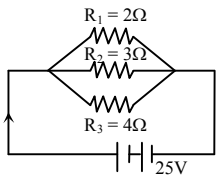


The state of motion of an object of mass 100gm is shown in the above figure.

17. What is the kinetic energy of the object at point 'A'?
a 10J b 20J
c 30J d 40J

18. For the object —
i. velocity is uniform
ii. acceleration is uniform
iii. applied force is uniform
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii
[N.B.: Correct answer : (i)]

Follow the circuit and answer to the questions no. 19 and 20:



19. What is the equivalent resistance in ohm?
a 1.083 b 1.83
c 1.00 d 0.923

20. If all the resistance are connected in series combination then the electric current —
i. will decreased
ii. will increased
iii. will remain unchanged
Which one is correct?
a i b ii
c i and ii d i and iii

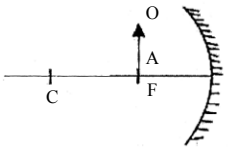
21. How much force is experienced by a body of charge 10C when it is placed in a electric field of electric intensity 30 NC^{-1}?
a 3N b 20N
c 200N d 300N

22. Which one of the following is correct, when the separation between two charges q_1 and q_2 is *'d'*?
a $F = \frac{cq_1q_2}{d^2}$ b $F = \frac{cq_1q_2}{d}$
c $F \propto \frac{q_1q_2}{d}$ d $F \propto \frac{d^2}{q_1q_2}$

23. What is the power (in watt) of a boy of mass 40 kg if he steps up 6m high stair in 12S?
a 20 b 32.66
c 196 d 786

24. Which one is correct for the energy convartion of a car engine?
a Mechanical energy → Chemical energy
b Chemical energ → Mechanical energy
c Thermal energy → Chemical energy
d Chemical energy → Electrical energy

According to the folliwing figure answer to the question no. 25:



25. Where the image will be formed for the object *'OA'* mentioned in the above figure?
a At infinity
b Between principal focus and pole
c At principal focus
d At centre of curvature

Ans.																										
	1	b	2	c	3	b	4	a	5	c	6	c	7	d	8	d	9	a	10	d	11	c	12	c	13	c
	14	c	15	b	16	d	17	b	18	*	19	d	20	a	21	d	22	a	23	c	24	b	25	a		

49. Cumilla Board 2017

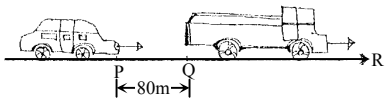
Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ The vernier constant of a slide caliperse is 0.01 cm. Diameter of a sphere is measured using this slide caliperse. Here the main scale reading is 12.2 cm, vernier coincidence is 5. There is no instrumental error in this slide caliperse. The mass of the given sphere is 1 kg.

a. What is called least count? 1
b. Force is a derived quantity− Explain. 2
c. Determine the radius of the given sphere. 3
d. The sphere will whether sink or float in water − Explain with mathematical logic. 4

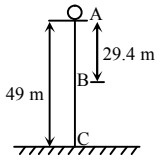
2. ▶



A private car moves with a uniform velocity $21ms^{-1}$ from position P and a truck moves from rest with a uniform acceleration $2ms^{-2}$ from position Q in the same time and same direction.

a. What is called pitch? 1
b. Force is a derived quantity − Explain. 2
c. Determine the distance travelled by the truck in 20th second. 3
d. How many times will the private car and the truck meet together? Explain with mathematical logic. 4

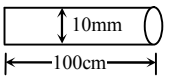
3. ▶



A body of mass 100g is static at a point A. The body is released from that point.

a. Write down the Newton's second law of motion. 1
b. Why does a screw get stagnated with a wall when it is penetrated into the wall? Explain. 2
c. Determine the maximum Kinetic Energy of the body. 3
d. The total energy of the body at point A and B remains the same − Explain with mathematical logic. 4

4. ▶



Copper wire

$\gamma = 50.1 \times 10^{-6}\ K^{-1}$
$S = 400\ Jkg^{-1}\ K^{-1}$
$\rho = 8960\ kg\ m^{-3}$

The temperature of the copper wire is increased by 150°C.

a. What is called triple point of water? 1
b. Pressure is a thermometric property of matter − Explain. 2
c. Determine the required amount of heat applied on the copper wire. 3
d. Will the copper wire be made to penetrate after applying heat through a ring of diameter 10.06 mm? Explain with mathematical logic. 4

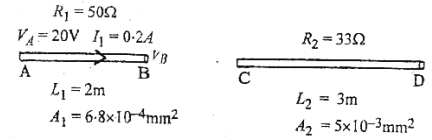
5. ▶ A person standing between two ten storied buildings shot a bullet from a gun. He heard the first echo after 2s and second echo after 2.15s. The temperature of air was 35°C at that time.

a. What is called amplitude? 1
b. The intensity of sound is 40 Wm^{-2}− What does it mean? 2
c. Determine the distance between the buildings. 3
d. At what time after hearing the second echo, he will hear the third echo? Explain with mathematical logic. 4

6. ▶ A body is placed on the principal axis at a distance 20 cm of a lens of power + 2.5d.

a. What is called radioactivity? 1
b. A normal eye can see an object of any distance − Explain. 2
c. Determine the distance of the image of the object. 3
d. Which defect can be rectified with the help of the given lens? Explain with ray diagram. 4

7. ▶



a. What is called electric field? 1
b. If the distance between two point charge is halved what will be the change of coulomb force between them? − Explain. 2
c. Determine V_B. 3
d. The conductivity of the material of which wire is more? Explain with mathematical logic. 4

8. ▶

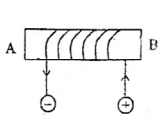


Fig-1

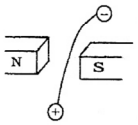


Fig-2

a. What is angiography? 1
b. How does a speaker work? Explain it. 2
c. Which one is north-pole in fig 1? Explain. 3
d. In which direction will the wire in fig 2 acquire resultant force? Explain it. 4

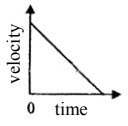
Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

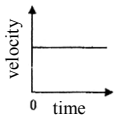
[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

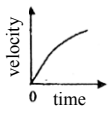
1. If light falls then a sensation of vision is created in the brain in which object?
a Rods b Cones
c Eye lens d Retina

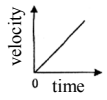
2. Which supports the product of force and velocity from the following?
a Impulse b Power
c Pressure d Energy

3. Which graph indicates the law of falling bodies?

a 

b 

c 

d 

4. How much volt is the potential of earth?
a Zero b 440
c 33000 d Infinity

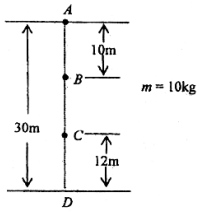
5. Partial blockage developed in the coronary arteries of heart is identified by which test?
a Angiography b ETT
c ECG d CT Scan

6. The lines of force of cylindrical shaped coil wire is similar to —
a U shape magnet
b ceramic magnet
c bar magnet
d horse leg shape magnet

7. Which relation is correct in calculation of electrical energy spent?
a $W = I^2Rt$ b $W = IRt$
c $W = \frac{Vt}{R}$ d $W = \frac{Vt}{R^2}$

8. What is the refractive index of glass when the critical angle of glass is 45° with respect to air?
a $\sqrt{2}$ b $\frac{1}{\sqrt{2}}$
c 1 d $\frac{1}{2}$

On the basis of the following fig. answer questions number 9 and 10:



9. What is the potential energy at point *A*?
a 2940J b 2900J
c 2840J d 2800J

10. On the basis of the above fig. which is correct?
a The potential energy at point C is more than at B.
b The kinetic energy at point C is more than at point B.
c The kinetic energy at point C is more than the potential energy at point B.
d The potentisl energy at point C is less than the kinetic energy at point B.

11. Which relation is correct in transformers?
a $E_Pn_p = E_sn_s$ b $E_sI_P = I_PI_s$
c $I_pn_s = I_sn_P$ d $E_pn_s = E_sn_p$

12. Which scientist invented the radio-activity of uranium?
a Max Plank b Becquerel
c Albert Einstein d Neill Bohr's

13. At which altitude the value of 'g' is standard at sea level?
a 30° b 45°
c 60° d 90°

14. Atmospheric pressure —
i. it decreases as the height from the earth increases
ii. the density of air is increased as it is decreased
iii. as weight of air-column increases it increases
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

15. On the body of an electric bulb 60W – 220V is writeen. What is the resistance of the bulb?
a 16.36Ω b 160Ω
c 280Ω d 806.67Ω

16. Which does play vital role for safe journey?
a Mass b Weight
c Speed d Friction

17. Which one is software?
a Processor b Monitor
c Printer d Windows 98

18. If medium a is denser with the respect of medium *b* then —
i. ${}_a\eta_b < 1$ ii. ${}_a\eta_b > 1$
iii. ${}_b\eta_a > 1$
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

19. What is the speed of sound at 10°C in normal pressure?
a $332ms^{-1}$ b $332.6ms^{-1}$
c $338ms^{-1}$ d $338.6ms^{-1}$

20. In combinated circuit —
i. all points carry equal current in series connection
ii. at different point of the circuit flows different current in series connection
iii. in parallel connection the total cureent is equal to the sum of the currents at different points
Which one of the following is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

21. What is the temperature at the triple point of water?
a 0 K b $\frac{1}{273}$ K
c 273 K d 373 K

22. What is the relation between frequency and time period?
a Proportional
b Inversely proportional
c Proportional of square
d Inversely proportional of square

23. To avoid the explosion of aeroplane —
i. the wheels of aeroplane are made of conductor rubber
ii. as soon as the aeroplane ground at land the fuel loading will start
iii. a conductor is to be connected to the aeroplane and to the ground just before the fuel loading is started
Which one of the following is correct?
a i and ii
b ii and iii
c i and iii
d i, ii and iii

24. In electric field at 40C charge is placed it gained 160N. At that point if 50C charge is placed which force is gained?
a 12.5N
b 128N
c 150N
d 200N

25. Which one of the following is used in convex mirror?
a Car
b Radar
c Torch light
d Solar oven

Ans.	1	d	2	b	3	d	4	a	5	b	6	c	7	a	8	a	9	a	10	b	11	d	12	b	13	b
	14	c	15	d	16	c	17	d	18	c	19	c	20	b	21	c	22	b	23	c	24	d	25	a		

50. Chattogram Board 2017

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associatd questions. Answer any five Questions.]

1. ▶ A motor of 15kw can lift 2 quintal water in 1 minute at a height of 300m.

a. What is called scientific symbol? 1

b. Write down two differences between linear motion and rotational motion. 2

c. What is the effective power of the motor? 3

d. What will be the change in energy spent by the motor if the efficiency is increased by 5%? Analyze mathematically. 4

2. ▶ Kinetic energy is a kind of mechanical energy. The mass of Rahim is 30kg and of karim is 20 kg. Rahim runs with a velocity $5ms^{-1}$ and karim with a velocity $6ms^{-1}$. Total work done by them to get this velocity is kinetic energy.

a. Write down Newton's second law? 1

b. Can the kinetic energy of Rahim be negative? 2

c. Whose kinetic energy was less? Calculate it. 3

d. If the momentum of Rahim and Karim is same then whose kinetic energy will be more relatively? 4

3. ▶ Palash makes a sound in front of a hill. After 0.15s he heard an echo. The temperature of air was 30°C.

a. What is wave? 1

b. Why all reflected sound cannot be heard? 2

c. What was the distance between Palash and the hill? 3

d. If Palash continue to move towards the hil then what will be the maximum distance he heard the echo? Analyze mathematically. 4

4. ▶ The area of the lower part of a rectangular block is $25cm^2$. It is sunk into water. The density of water is 1000 kgm^{-3}. The height of the upper surface of the block from the upper surface of water is 5cm. The height of block is 5cm.

a. What is density? 1

b. What is the cause of flotting and sinking of a solid body? Explain. 2

c. Find out the pressure at the lower surface of the block. 3

d. Do it follow the Archimedes' Principle? Analyze. 4

5. ▶

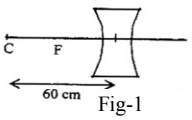


Fig-1

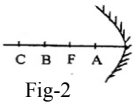


Fig-2

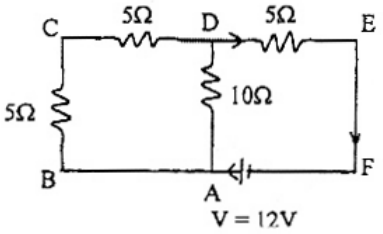
a. What is called optical center of a lens? 1

b. Explain the accommodation of eye. 2

c. Find the power of lens in figure 1. 3

d. How will be the image if the object is kept at A and B in figure 2? Analyze with ray diagram. 4

6. ▶ The current of the circuit is 1-5A.



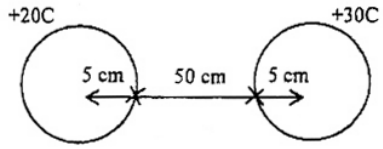
a. What is electric circuit? 1

b. Explain the system loss of current. 2

c. Find out the energy spent in 5minutes. 3

d. Will the potential difference within AD and within DE will be same? Analyze mathematically. 4

7. ▶



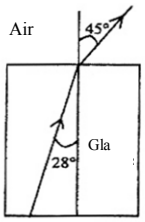
a. What is called electric intensity? 1

b. Write down two differences between α and γ ray. 2

c. What is the repulsion force between the charges? 3

d. What will be the change in force if the charge is connected by an wire? Analyze mathematically. 4

8. ▶



a. Write down the Snell's Law. 1

b. Explain perceptions of coloured object. 2

c. What will be the velocity of light in glass? 3

d. The reflected ray will go towards the plane of separation for what change of incident angle. Analyze mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

1. Which of the following is scalar quantity?
a Electric Intensity b Acceleration
c Weight d Pressure

2. Power of a lens is 2.5D. What is the focal length of the lens?
a 20 cm b 40 cm
c 60 cm d 80 cm

3. Which of the following is conductor?
a Human body b Wood
c Paper d Plastic

4. What is the type of motion of piston in a cylinder of petrol engine?
a Linear motion b Circular motion
c Rectilinear motion d Periodic motion

5. Which of the following is the SI unit of amount of substance?
a kg b Mole
c Candela d Lux

6. Which of the following part of eye is responsible for the sensation of vision in the brain when light falls on it?
a Retina b Cornia
c Iris d Sclerotic

7. Which of the matter's specific heat is minimum?
a Lead b Silver
c Copper d Water

Read the stem carefully and answer questions no. 8 and 9:
A body of mass 10 gm is thrown vertically upward. It comes to the ground after 10 seconds.

8. For the object —
i. Starting velocity was 49 ms^{-1}
ii. Maximum height will be 122.5 m
iii. The potential at maximum height will be 100J
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

9. How will be the velocity at the time of touching the ground with respect to starting velocity?
a Same velocity
b Less velocity
c More velocity
d Double velocity

10. Which of the following is the alpha particle?
a Helium nucleus b Tritium
c Deuterium d Hydrogen particle

11. Which of the following is insulator?
a Human body b Soil
c Glass d Iron

12. When a rod of ebonite is rubbed with flannel —
i. Both of them become negatively charged
ii. Flannel becomes positively charged
iii. Ebonite rod gets charged negatively
Which one of the following is correct?
a i b ii
c iii d i and iii

13. Induced voltage or induced current can be increased in the following way —
i. Increasing the number of coil
ii. Moving the magnet or the coil slowly towards or away from electric circuit
iii. Decreasing the polar power of magnet
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

14. Which of the following words is regarding petroleum?
i. Petroleum is Greek word
ii. Petroleum products are used mainly to produce elecric and mechanical energy
iii. There is nothing like petrol to be used as fuel of vehicle
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

15. The images formed by a plane mirror have the following properties —
i. The size of the image is equal to the size of the object
ii. The image is real and erect
iii. The distance of image and object from the mirror are same
Which one of the following is correct?
a i and ii b ii and iii
c i and iii d i, ii and iii

16. Who, the ancient scientist, is partially contributed to the research on the vibration of strings used in musical instrument at present?
a Thales b Pythagoras
c Democritus d Archimedes

17. What will be the minumum hearing distance of the reflections to hear an echo of sound at 40°C in air?
a 17.8 m b 17.6 m
c 17.4 m d 16.6 m

18. A body of mass 5 kg was dropped from the roof of a building. What will be the Kinetic Energy just before it touches the ground?
a 245 J b 845 J
c 1225 J d 2450 J

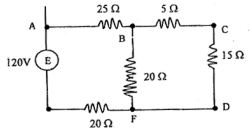
19. How many electrode used to get complete image of heart?
a 4 b 6
c 10 d 12

20. Which of the following does not depend upon pressure at a point in a liquid at equilibrium?
a Density of the liquid
b Area of the base of the vessel
c Depth of the liquid
d On-acceleration due to gravity

21. Who, the ancient scientist, is famous for his predictions regarding solar eclipse?
a Pythagoras
b Thales
c Greek philosoher Democritus
d Archimedes

22. Which of the following is used in parlor?
a Plane mirror b Convex mirror
c Concave mirror d Concave lens

Watch the following electric circuit carefully and answer to the questions no. 23 and 24:



23. What is the resistance across AF?
a 40 Ω b 35 Ω
c 30 Ω d 25 Ω

24. Calcuate the current flowing through the circuit —
a 0.12 A b 0.20 A
c 2.2 A d 2.8 A

25. Radium metal transactions into which of the following through radioactive disintegration step by step?
a Aluminium b Lead
c Silver d Iron

Ans.																											
	1	d	2	b	3	a	4	d	5	b	6	a	7	a	8	a	9	a	10	a	11	c	12	b	13	a	
	14	b	15	d	16	b	17	a	18	d	19	c	20	b	21	b	22	a	23	b	24	c	25	b			

51. Sylhet Board 2017

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶ An object from rest travels the distance 50m in 5 seconds with uniform acceleration.

a. What is called acceleration? 1
b. Why is the acceleration of an object moving uniformaly zero? 2
c. What will be the velocity of the object after 15 seconds? 3
d. How long will the object take to travel the next 30m distance? Show it through mathematical analysis. 4

2. ▶

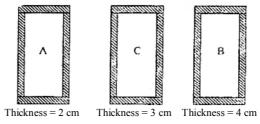


Fig: Three pieces of wood of different thickness: A, B, C

A bullet of mass 10 gm with a velocity 300ms^{-1} Penetrates one third of total thickness of three pieces of wood A, B, C and after this its velocity became half.

a. What is called gravitational force? 1
b. Why is frictional force produced? 2
c. Find out the value of the opposing force. 3
d. Can the bullet penetrate the rest of the thickness of woods afterward or not? Give your opinion through mathematical analysis. 4

3. ▶

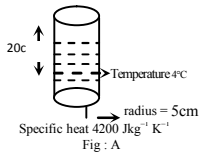


Fig : A

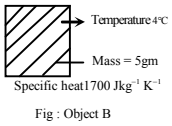
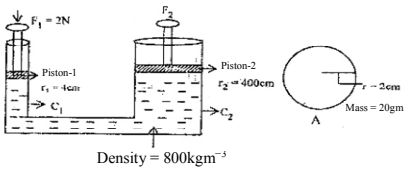


Fig : Object B

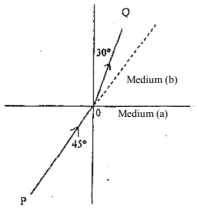
a. What is called 1 Kelvin? 1
b. Why is air of fan felt cold in sweating body? Explain. 2
c. Find out the value of the temperature of the object B in Fahrenheit scale. 3
d. What is the amount of heat needed to increase the temperature of only liquid of the container A and object B through 30°C separately? Which one needs more and how much? Analyse mathematically, (At 4°C, the mass of 1c.c water is 1 gm) 4

4. ▶



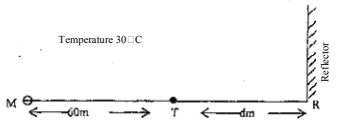
a. What is called potential energy? 1
b. What is Torricelli's vacuum? Explain. 2
c. Find out the experienced force on the piston-2. 3
d. If the object A is released in the liquid of the stem, will it float or immerse? Analyse mathematically. 4

5. ▶



a. What is refractive index? 1
b. Why are two eyes having in human body advantageous? 2
c. Find out the relative refractive index of medium (a). 3
d. What will happen to the light ray if two media of the stem are interchange with each other and light ray PO is incident along the same direction? Give your opinion through mathematical analysis. 4

6. ▶



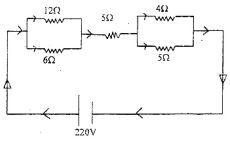
a. What is echo? 1
b. Why is the velocity of sound more during daytime than night? 2
c. Find out the distance between the position M and reflector R. 3
d. If sound is produced at position T, will echo be heard? If echo is heard, then after how long will echo be heard? Give your opinion through mathematical analysis. 4

7. ▶

Transformer		Number of Turns		Electric Current		Voltage
A	Primary	Secondary	Primary	Second	Primary	Secondary
A	30	300	6A	–	500V	–
B	60	30	–	–	500V	–

a. What is called electric induction? 1
b. What do you mean by combined circuit? Explain it. 2
c. Find out the electric current in secondary coil of transformer A. 3
d. Which one is cunvenient for dwelling house and for industrial uses by determining voltage difference in secondary coil of transformer A and B? Give your opinion. 4

8. ▶



a. What is called electromotive force? 1
b. How are the area of cross section and resistance of conductor related? Explain. 2
c. Determine the equivalent resistance of the above circuit. 3
d. How are the resistances of the circuit of stem rearranged so that the flow of current will be 12.98A? Draw the circuit by analysing mathematically. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

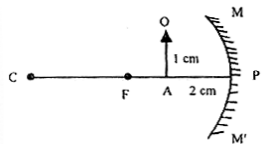
[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

1. Which substance has least specific resistance?
a Silver b Copper
c Tungsten d Nichrome

2. Vernier constant of a slide callipers is 0.005cm. What is the total number of division of vernier scale?
a 5 b 10
c 15 d 20

3. The potential difference between two ends of filament of a bulb is 12V and its resistance is 4Ω. What is the flow of current?
a 3A b 4A
c 8A d 10A

Answer the questions no. 4 and 5 in the light of given figure:



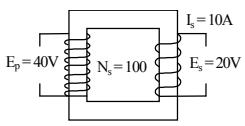
4. What will be the nature of the image of the object OA?
a Real and inverted
b Virtual and diminished
c Virtual and magnified
d Virtual and inverted

5. If the image of the object OA is formed at a distance twice of AP from mirror, what is the magnification of the image?
a $\frac{1}{4}$ b $\frac{1}{2}$
c 1 d 2

6. If the specific heat of copper is 400 $JKg^{-1}k^{-1}$, what is the heat capacity of copper of mass 5 kg?
a 400 JK^{-1} b 500 JK^{-1}
c 1000 JK^{-1} d 2000 JK^{-1}

7. The velocity of sound in air is 340ms^{-1} and time to hear an each is 1.5s. What is the distance between source and reflector?
a 250 m b 255 m
c 260 m d 265 m

8.

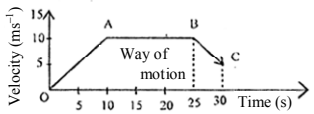


If the flow of current of secondary coil is made 3 times, what will be the change of he number of turns of primary coil?
a Half b 2 times
c 3 times d 6 times

9. Who invented of vacuum tube first?
a Addision b Fleming
c Marconi d De Forest

10. Which one is used in the treatment of blood-leucamia?
a Co-60 b Iodine-131
c Technetium-99m
d Phosphorus-32

Answer the questions no. 11 and 12 according to given figure:



11. In which part of the graph is the car moving with uniform velocity?
a OA b AB
c BC d AO and BC

12. If the mass of the car is 600 kg, then what will be the opposing force in the portion BC of the stem?
a 0 N b 100 N
c 600 N d 1200 N

13. Which one of the following is a special filtration machine?
a Kidney b Heart
c Stomach d Liver

14. Who gave the concept of Solar-centered theory?
a Romar b Copernicus
c Trychobrahe d Kepler

15. A boy of mass 50 kg runs with a velocity 7ms^{-1}. What is his kinetic energy?
a 350 J b 490 J
c 1225 J d 3430 J

16. For a body moving with uniform acceleration starting from rest —
i. velocity is proportional to time
ii. velocity is proportional to distance
iii. the distance travelled is proportional to the square of the time
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

17. Who gave the laws of falling bodies?
a Dr. Gilbert b Galileo
c Newton d James Watt

18. The powr of lens is +4D, it means —
i. focal length be 25 cm
ii. the image of the object placed at a distance 2 cm away from the optical centre of the lens be virtual
iii. the lens is used as aid lens to remedy short sight
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

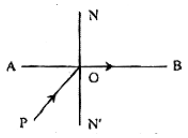
19. Which one is the main fuel of thermal power station?
a Coal b Mineral oil
c Wind d Solar energy

20. Plasma —
i. is the fourth state of matter
ii. particles carry electric charges
iii. particles have no definite shapes and volume
Which one is correct?
a i and ii b i and iii
c ii and iii d i, ii and iii

21. What is the co-efficient of volume expansion of copper?
a $50.1\times10^{-6}K^{-1}$
b $33.4\times10^{-6}K^{-1}$
c $16.7\times10^{-6}K^{-1}$
d $13.7\times10^{-6}K^{-1}$

22. If the frequency of sound is increased in a definite medium, which one of the following will decrease?
a Wave velocity b Amplitude
c Time period d Phase

23. Which one is the critical angle in the figure?



a ∠PON' b ∠AOP
c ∠AON d ∠BON

24. What is the refractive index of optical fibre material?
a 1.3 b 1.5
c 1.7 d 2.4

25. Static electricity is used in —
i. Spray gun
ii. Photocopier
iii. Ink Jet Printer
Which one is correct?
a i and ii
b i and iii
c ii and iii
d i, ii and iii

Ans.																											
	1	a	2	d	3	a	4	c	5	d	6	d	7	b	8	c	9	b	10	d	11	b	12	c	13	a
	14	b	15	c	16	b	17	b	18	a	19	a	20	d	21	a	22	c	23	a	24	c	25	d		

52. Jashore Board 2017

Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ▶

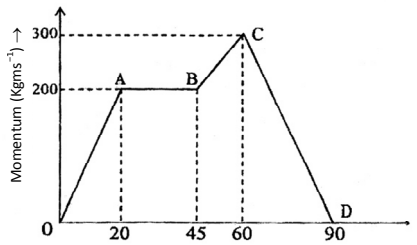
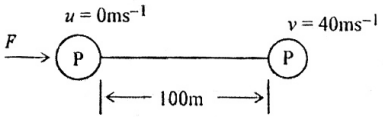


Fig: Momentun-time graph is given of a body of mass 10 Kg.

a. Wirte down the law of conservation of momentum. 1
b. It seems the tree moving backward from a running bus − explain. 2
c. Determine the distance traveled by the body in first 25 second. 3
d. Compare with mathematical logic the active force on the body in OA, AB and CD part. 4

2. ▶



Mass of the body 'P' is 5 Kg and frictional force is 10 N.

a. Write the third law of freely falling bodies. 1
b. The electric fan does not stop moving just after the switch turns off− Explain. 2
c. Determine F. 3
d. If the force is removed after passing 100m what total time from the beginning will the body take to stop? 4

3. ▶ A container is full of water and another container is full of kerosene oil. The height of the first container is 75 cm. The densities of water and kerosene oil are 1000 Kgm^{-3} and 800 Kgm^{-3} respectively. There is another body whose volume is 400 cm^3.

a. Write down the Hooke's law. 1
b. The lower part of an embankment is wider than the upper part− explain. 2
c. Determine the amount of pressure at the bottom of the first container. 3
d. If the given body is released in the first and then the second container, compare the buoyancy with mathematical logic. 4

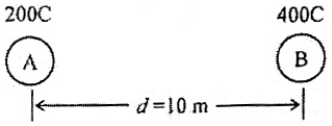
4. ▶ There is 200ml water of temperature 75°C in a container of copper of mass 500g of temperature 23°C. As a result the final temperature becomes 65°C. The apparent expansion of water is 1.49ml. (There is no donation and reception of heat in any other way). The co-effieient of volume expansion of the material of copper is $50.1 \times 10^{-6}K^{-1}$ and density of water is 1000Kg m^{-3}.

a. What is called density? 1
b. If a body is immersed in water, it seems to have lost a part of its weight − Explain. 2
c. Determine the real expansion of water. 3
d. How much excess water is required to increase the final temperature further 5°C? Explain with mathematical logic 4

5. ▶ A body is placed on the principal axis at a distance 20cm of a lens of power + 2.5d.

a. What is called radioactivity? 1
b. A normal eye can see an object of any distance − Explain. 2
c. Determine the distance of the image of the object. 3
d. Which defect can be rectified with the help of the given lens− explain with ray diagram. 4

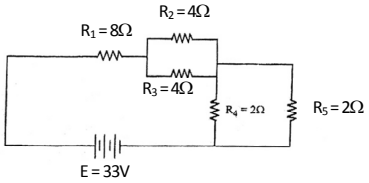
6. ▶



200J and 300J work are done to bring +5C charge from infinity to the electric field of A and B.

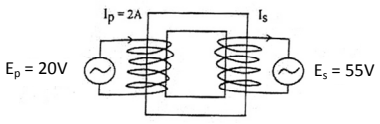
a. Write down the Coulomb's law. 1
b. Potential of a point charge will get decreased with the increase of distance in an electric field − Explain. 2
c. Determine the force between A and B. 3
d. If A and B are connected with a conducting wire determine the direction of flow of electron with mathematical logic. 4

7. ▶



a. What is called electric capacitor? 1
b. Explain the change of resistance of a copper wire if it is elongated by pulling uniformaly. 2
c. Determine the equivalent resistance of the circuit. 3
d. Which one of R_1, R_2 and R_4 is of more power? Explain with mathematical logic. 4

8. ▶



a. What is called half-life? 1
b. MRI is a painless and safe disease diagnosis method− Explain. 2
c. Determine Is. 3
d. Explain the mechanism the transformer if DC is used instead of AC in Ep. 4

Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.–** Candidates are asked not to leave any mark or spot on the question paper.]

1. Which one is the dimension of luminous intensity?
a I b J
c H d N

2. Which of the following are vector quantities?
a Work and displacement
b Energy and power
c Time and velocity
d Force and electric intensity

3. What m^3 is the volume of a sphere of radius 2m?
a $\frac{8}{3}\pi$ b 6π
c 8π d $\frac{32}{3}\pi$

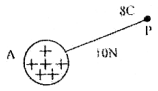
Answer the questions no. 4 and 5 according to the following stem:
A bullet of mass 20g is shot from a gun of mass 5kg with a velocity 500ms^{-1} for 0.1s.

4. What is the backward velocity of the gun in ms^{-1}?
a – 0.5 b – 2
c 0.5 d 2

5. In the incident —
i. the impulse of force of the gun is 10 Ns
ii. The initial momentum of the gun = the final momentum of the bullet
iii. the action force of the gun on the bullet is 100N
Which one is correct
a ii b iii
c i and iii d i and iii

6. Thermometric property of matter is used in —
i. wire of electic fuse
ii. filament of bulb
iii. alcoholic thermometer
Which one is correct
a i and ii b i and iii
c ii and iii d i, ii and iii

7.

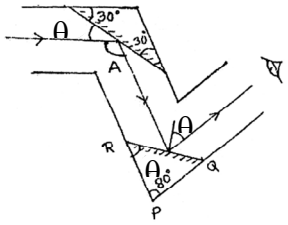


What will be the magnitude of intensity at a point P if A charged body is connected with the earth?
a 0 NC^{-1} b 0.8 NC^{-1}
c 1.25 NC^{-1} d 80 NC^{-1}

8. The solid substances whose volumes contract on melting their melting point reduce with —
a the increase of force
b the decrease of power
c the decrease of energy
d the increase of pressure

9. According to the real positive system all distances are to be measured starting from —
a focal point
b optical centre
c curved surface
d centre of curvature

Answer the questions no. 10 and 11 according to the following stem:

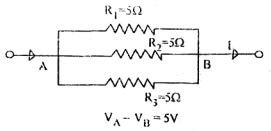


10. What is the value of the angle A?
a 30° b 60°
c 90° d 120°

11. When the spectator will not be able to see the image through the periscope?
a $\theta_1 = 40°$ b $\theta_2 = 40°$
c $\theta_3 = 30°$ d PQ = PR

12. Which of the following is colour sensitive?
a Iris b Cornea
c Con Cell d Pupil

13.



In the above circuit —
i. The value of I is 5A
ii. The power of circuit is 15W
iii. Equivalent resistance is $\frac{5}{3}\Omega$
Which one is correct
a i and ii b i and iii
c ii and iii d i, ii and iii

14. What are called the charges which accumulated in a conductor in electric induction process?
a Inducing charge
b Induced charge
c Electric induction
d Free charge

15. Which one of the following is used to test stomach?
a CT Scan b ECG
c Endoscopy d MRI

16. The temperature of a day is increased from 25°C to 30°C. What will be the increased temperature in Fahrennheit scale?
a 5°F b 9°F
c 32°F d 41°F

17. Flow goes tongiradinal wave propagate with the direction of frequency?
a Perpendicularly b Parallel
c Transversely d Producing crest

18. Time period of a sound wave is 5.8×10^{-4}s and velocity of sound is 320ms^{-1}. What is the wavelength of the sound wave?
a 0.19m b 1.86m
c 18.56m d 55.17m

19. On which does the resistance of a conductor depend?
a Potential
b Electric current
c Electric intensity
d Cross sectional area

20. Inertia of which of the equal volume of the following is more?
a Copper b Silver
c Mercury d Iron

Answer the questions no. 21 and 22 reading the following stem:
A carpenter is being made to enter a nail into a wood by a hammer>

21. What type of energy transformation takes place when the carpenter lifts the hammer up?
a Heat energy → Potential energy
b Chemical energy → Potential energy
c Mechanical energy → Potential energy
d Potential energy → Mechanical energy

22. What type of energy transformation takes place when the hammer falls down?
a Potential energy → Kinetic energy → Sound energy
b Chemical energy → Sound energy → Kinetic energy
c mechanical energy → Kinetic energy → Sound energy
d Potential energy → Sound energy → Heat energy

23. Where image will be formed if the object is placed between principal focus and pole in a concave mirror?
a In front of the mirror
b Behind the mirror
c At principal focus
d At pole

24. Which equation of the following is correct?
a $G = \frac{gM}{R^2}$ b $2S = ut + vt$
c $h = \frac{u^2 - v^2}{2g}$ d $S = \frac{v + u}{2t}$

25. What valency mole is used as impurity to form p = type semi-conductor?
a 3 b 4
c 5 d 7

Ans.																											
	1	b	2	d	3	d	4	d	5	d	6	d	7	a	8	d	9	b	10	d	11	a	12	c	13	c
	14	b	15	c	16	b	17	b	18	a	19	d	20	c	21	b	22	a	23	b	24	b	25	a		

53. Barishal Board 2017

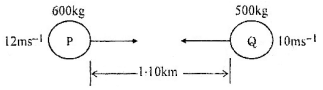
Time — 2 Hours 35 Minutes **Creative Essay Type Questions** Full marks — 50

[N.B. - The figures in the right margin indicate full marks. Read the following stems carefully and answer the related questions. Answer any five questions..]

1. ▶ The Vernier constant of a slide callipers is 0.01 cm. Diameter of a sphere is measured using this slide callipers. Here the main scale reading is 12.2 cm. Vernier coincidence is 5. There is no instrumental error in this slide callipers. The mass of the given sphere is 1kg.

a. What is called least count? 1
b. Force is a derived quantity − Explain. 2
c. Determine the radius of the given sphere. 3
d. Whether the sphere will sink or float in water − explain with mathematical logic. 4

2. ▶



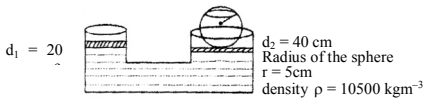
There is a collision between two cars P and Q after running a distance as a result the combined car moves together with a velocity $2ms^{-1}$ toward Q.

a. What is called balanced force? 1
b. Explain the effect of force on the shape of a body 2
c. At What time will the car P and Q meet together? 3
d. The incidence supports the law of conservation of momentum but not the Kinetic energy − Explain with mathematical logic. 4

3. ▶ An engine can lift 2000 litre water at the roof of a building of height 18 m in 1 minute. The efficiency of the engine is 70%.

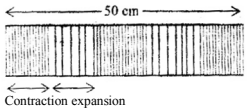
a. Write down the Pascal's law. 1
b. The potential energy of a body is 60J− what does it mean? 2
c. Determine the power of the engine. 3
d. What times more time is required to lift the same water at the same height if the efficiency of the engine is 60%? 4

4. ▶



a. What is called specific heat? 1
b. Iron rod is used to build house − explain. 2
c. Determine the mass of the sphere. 3
d. Will the body be lifted by applying 15N force in the smaller piston? Explain with mathematical logic. 4

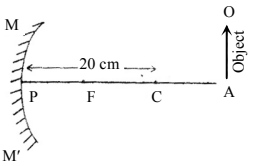
5. ▶



The velocity of sound in air is $347ms^{-1}$ and in water $1474.75ms^{-1}$.

a. What is called amplitude? 1
b. A sweating person feels cool under a running fan− explain why. 2
c. Determine the temperature of air. 3
d. What will be the change of wavelength of sound in water in compare with air? Explain with mathematical logic. 4

6. ▶

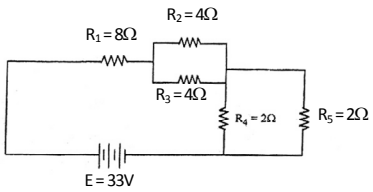


a. What is called optical fibre? 1
b. Refractive index of water with respect to air is 1.33 − what does it mean? 2
c. If a body is placed 30 cm away from the mirror, determine the distance of the image. 3
d. At what place should an object be placed to form real and magnified image? Explain with ray diagram. 4

7. ▶ Two charged bodies of 7.29 C and 12.25 C are placed at a distance of 700 cm in air. There is a point 'D' between them where the electric intensity is zero.

a. What is called electric induction? 1
b. There is no direct connection between the electric line and electric pillar − explain. 2
c. Determine the force between the charged bodies. 3
d. 'D' is whether the middle point or not between them − explain with mathematical logic. 4

8. ▶



a. What is called electric capacitor? 1
b. Explain the change of resistance of a copper wire if it is elongated by pulling uniformaly. 2
c. Determine the equivalent resistance of the circuit. 3
d. Which one of R_1, R_2 and R_4 is of more power? Explain with mathematical logic. 4

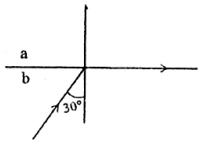
Time — 25 minutes **Creative Multiple Choice Questions** Full marks — 25

[Fill the circle completely (●) with the correct or most appropriate answer, corresponding to the question number. Make sure to use a ball point pen. Each question carries 1 mark. **N.B.**– Candidates are asked not to leave any mark or spot on the question paper.]

1. Where real image is formed?
a Plane mirror b Concave mirror
c Convex mirror d Concave lens

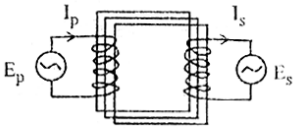
2. Which one is the example of infrasonic sound?
a the sound used in ultrasonography
b the sound used in kidney to turn the stone into dust
c the sound produced during earthquakes
d the sound used to destroy the harmful germs

3.



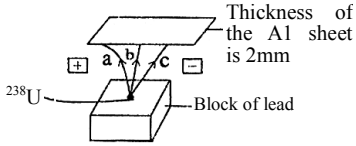
$_a\eta_b$ = ?
a 0.5 b 1.33
c 1.5 d 2

4.



E_p = 220 V
I_p = 10 V
E_s = 22 V
I_s = ?
a 100 A b 10 A
c 1 A d 0.1 A

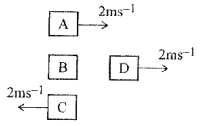
5.



Which one can penetrate aluminium sheet?
a a and b b b and c
c c and d d a, b and c

6. Who was the pioneer of the experimental scientific methods?
a Roger Bacon b Archimedes
c Galileo d Newton

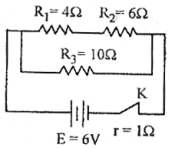
7.



In the above incidence —
i. A is static with respect to D
ii. B is moving with uniform velocity with respect to D
iii. the velocity of C is maximum with respect to D

Which one is correct
a i and ii b ii and iii
c i and iii d i, ii and iii

8. A body is released freely from rest, what times will be the velocty if four times displacement takes place?
a $\frac{1}{4}$ b $\frac{1}{2}$
c 2 d 4



Electric current I_1 and potential difference $V_1$of resistance R_1, electric current I_2 and potential difference V_2 of resistance R_2, electric current I_3 and potential different V_3 of resistance R_3.
Answer the question no. 9 and 10 in the light of the stem:

9. What is the equivalent resistance?
a 12.4 Ω b 7.75 Ω
c 8.86 Ω d 5 Ω

10. Which one is correct according to the given circuit?
a $I_3 > I_2 > I_1$ b $I = I_1 + I_2 + I_3$
c $V_3 > V_2 > V_1$ d $E = V_1 + V_2$

11. Which one is based on the principle of electromagnetic induction?
a Electric motor b Transformer
c Generator d Amplifier

12. Which test is done during exercise?
a Radio therapy b ETT
c Angiography d MRI

13. At what condition the Kinetic energy of a body will be 16 times?
a mass twice, velocity twice
b mass eight times, velocity half
c mass four times, velocity unchanged
d mass unchanged, velocity four times

14. What times will be the intensity of sound if the amplitude is four times?
a 2 b 4
c 8 d 16

The volume of a spherical body is 200 cm^3. Half of the body floats in water.
Answer the question nos. 15 and 16 in the light of the stem:

15. What is the weight of water displaced by the body?
a 0.98 N b 9.8 N
c 49 N d 9.8×10^5N

16. The sphere is of —
i. density 500 kgm^{-3}
ii. lost weight 49 N
iii. buoyancy 0.98 N
Which one is correct
a i and ii b ii and iii
c i and iii d i, ii and iii

17. Which pair is thermetric property of matter?
a volume, force b pressure, density
c resistance, mass d velocity, restivity

18. Which one is the unit of impulse of force?
a $kgms^{-2}$ b $kgms^{-1}$
c Nm d Js^{-1}

19. Which one is the correct transformation of energy of a running fan?
a Electric energy → magnectic energy → mechanical energy → heat energy
b Electric energy → mechanical energy → sound energy → heat energy
c Electric energy → heat energy → magnetic energy →mechanical energy
d Electric energy → mechanical energy → magnetic energy → heat energy

20. Which one is the input device of a computer?
a RAM b Scanner
c ROM d Speaker

A body	A	B	C	D
Volume (cm^3)	2500	2000	1500	1000
Density (kgm^{-3})	7800	8900	10500	19300

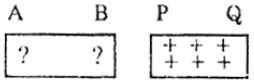
Answer the questions no. 21 and 22 according to the above information:

21. What is the mass of B?
a 17.8 kg b 1780 kg
c 178000 kg d 17800000 kg

22. If same amount of force is applied on each body at rest —
i. the velocity of B will be more than A
ii. the velocity of C will be more than B
iii. the velocity of D will be more than C
Which one is correct
a i and ii b ii and iii
c i and iii d i, ii and iii

23. Which one is used to identify colour?
a Retina b Cornia
c Rod Cell d Cone Cell

24.



Which statement is correct?
a The end A is negative charged
b Net charge of A will be zero if 'A' is connected with earth
c Net charge of B will be zero if 'A' is connected with earth
d AB remains charged if PQ is removed

25. Which one is safe during the storm and rain?
a to stay under any tree
b to stay on an iron bridge
c to stay in empty place
d to stay under an umbrella

Ans.																									
	1	b	2	c	3	b	4	a	5	b	6	c	7	d	8	c	9	d	10	c	11	a	12	b	13	d
	14	d	15	a	16	c	17	b	18	b	19	a	20	b	21	a	22	a	23	d	24	b	25	c		

Additional part of the Main Practice Book

N

Creative Essay Type

Chapter-1

Physical Quantities and Their Measurements

Ques. ▶1 **Scenario-1 :** By using slide calipers determining the length of a rod main scale reading is 4.2 cm and the length of the rod is 4.25 cm.

The number of Vernier divisions of the instrument is 20 and the length of one smallest division of main scale is 1 mm.

Scenario-2 : The information's related with a moving car is given in the following table:

Time (second)	0	12	24	36	48	60
Distance (meter)	0	6	12	18	24	30

[M.B.-20 ❙Ques. No.-1]

a. What is called Vernier constant? 1

b. Moving object has distance travelled but may not have displacement.—Explain. 2

c. Find out the Vernier super-imposition in the light of scenario-1. 3

d. Draw the distance—time graph according to scenario-2 and does the obtained graph make an angle 45° with X-axis? Put your opinion through analysis. 4

Answer to the question no. 1

a The difference between one division of Vernier scale and one division of the main scale is called Vernier constant.

b Distance is defined to be the magnitude or size of displacement between two positions. Note that the distance between the two positions is not the same as the distance traveled between them.

Distance traveled is the total length of the path traveled between two positions. Distance traveled is not a vector. It has no direction and, thus, no negative sign. It is important to note that the distance traveled does not have to equal the magnitude of the displacement (i.e., distance between the two points). Specifically, if an object changes direction in its journey, the total distance traveled will be greater than the magnitude of the displacement between those two points.

c Given,

The length of the rod, L = 4.25cm

Main scale reading, M = 4.2cm

Vernier constant, $VC = \frac{S}{n} = \frac{1mm}{20} = \frac{0.1cm}{20}$

$= 0.005cm$

Verniner supper-imposition, V =?

We Know,

$L = M + V\,Vc$

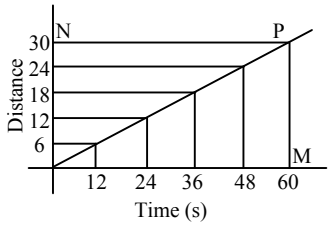
$\Rightarrow 4.25 = 4.2 + v \times 0.005$

$\Rightarrow V = \frac{4.25 - 4.2}{0.005}$

$= 10$

$\therefore$ Vernier super-imposition is 10.

d Distance time graph is given below according to the scenario – 2



From graph, $\text{slope} = \frac{PM}{PN} = \frac{30}{60} = \frac{1}{2}$

We know, slope = tanθ

$\therefore \tan\theta = \frac{1}{2}$

$\theta = \tan^{-1}\left(\frac{1}{2}\right) = 26.57°$

$\therefore$ The graph makes an angle 26.57° with X-axis. So the statement is not true.

Ques. ▶2 The vernier constant of a slide calliper is 0.01 cm. The diameter of a sphere is measured using this slide callipers. Here the main scale reading is 12.2 cm, vernier coincidence is 5. There is no instrumental error in this slide callipers. The mass of the given sphere is 1 kg. *[C.B.; B.B.-17 ❙Ques. No.-1]*

a. What is called least count? 1
b. Force is a derived quantity− Explain. 2
c. Determine the radius of the given sphere. 3
d. The sphere will whether sink or float in water − Explain with mathematical logic. 4

Answer to the question no. 2

a If the circular scale is rotated only one division the distance that the screw covers for that one rotation is said to be the least count.

b We know,

$$\text{Force} = \text{Mass} \times \text{Acceleration} = \text{Mass} \times \frac{\text{Velocity}}{\text{Time}}$$

$$= \text{Mass} \times \frac{\text{Displacement}}{(\text{Time})^2}$$

Here, mass, displacement and time are fundamental quantities. So, as force is a quantity that we get from more than one quantity it is a derived quantity.

c Given that,
Slide caliper's main scale reading, $M = 12.2$ cm
Vernier superimposition, $V = 5$
Vernier constant, $VC = 0.01$ cm
Sphere's diameter,

$$d = M + V \times VC = 12.2 \text{ cm} + 5 \times 0.1 \text{ cm}$$
$$= 12.25 \text{ cm}$$ **(Ans.)**

d Now, given that,
Mass of sphere, $m = 1$ kg
Diameter, $d = 12.25$ cm
$\therefore$ Radius, $r = 6.125 \text{ cm} = 6.125 \times 10^{-2}$ m
We know, Volume of sphere,

$$V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times 3.1416 \times (6.125 \times 10^{-2} \text{ m})^3$$
$$= 9.625 \times 10^{-4} \text{ m}^3$$

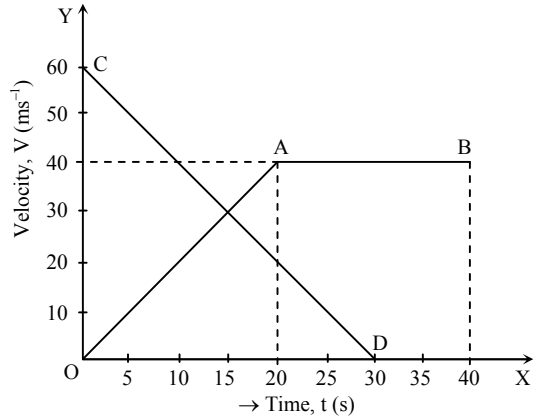
Mass of 1 m^3 water = 1000 kg
Mass of $9.625 \times 10^{-4} m^3$ kg water

$$= 1000 \times 9.625 \times 10^{-4}$$
$$= 0.9625 \text{ kg}$$

As sphere's mass is 1 kg and the quantity of dispelled water is 0.9625 kg, so it will drown.

Chapter-2
Motion

Ques. ▶1



The graph shows velocity vs time. From the graph OAB line for the first car and CD line for the second car. *[D.B.-20 ❙Ques. No.-4]*

a. What is periodic motion? 1
b. Why the travelling distance is not equal when same amount of force applied of different mass bodies? 2
c. Determine the acceleration of the first car. 3
d. Which car travelling more distance in 30s? Analyze mathematically. 4

Answer to the question no. 1

a If the motion of a moving object is such that it passes repeatedly through a definite point in the same direction in the same manner in a definite interval of time, then this motion is called periodic motion.

b When the same amount of force applied to different mass bodies, the bodies get different amounts of acceleration. Different accelerations produce different velocities to the bodies. So the bodies travel a different distance.

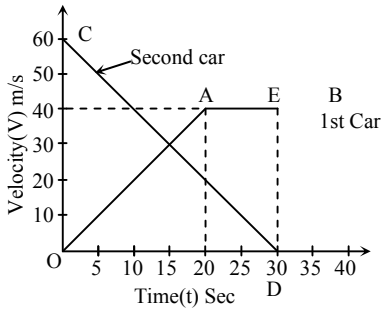
c From the graph,
The first car trovelled from 'O' to 'A' with velocity from o m/s to 40m/s with in 20sec.

Therfore, acceleration $a = \frac{v - u}{t}$

$$= \frac{40 - 0}{20}$$
$$= 2 \text{m/s}^2$$

$\therefore$ the acceleration of the first car is 2m/s^2.

d The area under the velocity vs time grouph indictes the distance travelled.



For the first car, the area under the curve OAE is OAED. Therefore the distance travelled in 30 seconds is equal to area of trapizium OAED.

Now, area of the trapizium OAED $= \frac{1}{2}$ (AE + OD) × ED

$= \frac{1}{2}$ (30 – 20 +30) × 40

$= \frac{1}{2} \times 40 \times 40$

$= 800$

∴ Distance travelled by first car is 800m.

The line CD represents the second car.

Similarly, area of OCD $= \frac{1}{2} \times$ DC × OD

$= \frac{1}{2} \times 30 \times 60$

$= 900$

Therefore, distance travelled by the second car is 900m.

The second car is travelling more distance than the first car.

Ques. ▶2 The following table shows the magnitude of velocity of a moving car for different time intervals :

Velocity (ms^{-1})	2	4	6	6	7	8
Time (s)	0	5	10	15	20	25

[R.B.-20 ❙Ques. No.-1]

a. What is called periodic motion? 1

b. "Oscillatory motion is a periodic motion"— Explain. 2

c. Calculate the distance covered by the car in 15th second. 3

d. Draw and analyze the "Velocity-Time" graph of the car. 4

Answer to the question no. 2

a If the motion of a moving object is such that it passes repeatedly through a definite point in the same direction in the same manner in a definite interval of time, then this motion is called periodic motion.

b If the motion of a moving object is such that is passes repeatedly through a definite point in the same direction in the same manner in a definite interval of time, then this motion is called periodic motion. Again, the repeated motion in which an object repeats the same movement over and over is called oscillatory motion. So, all oscillatory motions are periodic because each oscillation gets completed in a definite interval of time.

c According to the given stem,

Initial velocity, u = 2m/s

Time, $t_1 = 14s$

Time, $t_2 = 15s$

Distance travelled at the 15th second =?

We know,

The car moves with uniform acceleration for the first 10s.

So, $a = \frac{v-u}{t} = \frac{6-2}{10} = 0.4 m/s^2$

Distance travelled in 10s, $s_1 = ut + \frac{1}{2}at^2$

$= 2 \times 10 + \frac{1}{2} \times 0.2 \times 10^2 = 30m$

The car moves with uniform velocity for the next 5s

Therefore, Distance travelled in 14s, s_2 = Distance travelled in 10s + Distance travelled in 4s

For $t_1 = 14s$, Distance travelled, $s_2 = vt_1 = 6 \times 4 = 24m$

So, Distance travelled in 14s, $s_2 = (30 + 24) = 54m$

Again, Distance travelled in 15s, s_3 = Distance travelled in 10s + Distance travelled in 5s

For $t_2 = 14s$, Distance travelled, $s_3' = vt_2 = 6 \times 5 = 30m$

So, Distance travelled in 15s, $s_3 = (30 + 30) = 60m$

Therefore,

Distance travelled in the 15th second, S = Distance travelled in 15s-Distance travelled in 15s

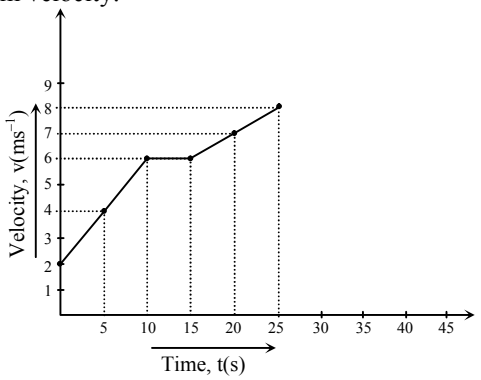
= 60-54 = 6m. **(Ans.)**

d According to the given data, velocity vs. time graph is drawn below,

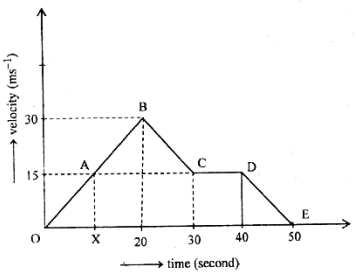
Finally, for the last 10s, the car moves with uniform acceleration,

Where $a = \frac{v-u}{t} = \frac{8-6}{10} = 0.2 m/s^2$.

As a whole, we can say that the car moves with non-uniform velocity.



Ques. ▶3 The graph shows velocity—time of a car.



[Dj.B.-19 ❙Ques. No.-1]

a. What is uniform acceleration? 1
b. Although the speed of the Earth around the sun is a periodic motion but not rotational motion. Explain. 2
c. Determine mathematically how much time indicate 'OX' in the graph. 3
d. How change is coming in acceleration when the car directly come from B point to E Point? Analyze mathematically. 4

Answer to the question no. 3

a If velocity of a body increases at the same rate at a certain direction then the acceleration of the body is called uniform acceleration.

b If the motion of a moving object is such that it passes repeatedly through a definite point in the same direction in the same manner in a definite interval of time, then this motion is called a periodic motion. Earth revolves around the Sun in the same direction in a parabolic path in every 1 year or 365 days, so the motion of Earth is periodic motion. Again, when a body rotates about a particular point or a line, keeping the distance of the particles of the body unchanged, it is called circular motion. Since orbit of Earth is parabolic, so the distance between Earth and Sun isn't always same, this distance is different at different times of the time period. So, motion of Earth is not circular motion.

c In the graph, OB part indicates uniform acceleration. In this case, if acceleration is a,

$$a = \frac{v - u}{t} = \frac{30 - 0}{20} = 1.5 \text{ ms}^{-2}$$

Here,
Initial velocity, $u = 0 \text{ ms}^{-1}$
Final velocity, $v = 30 \text{ ms}^{-1}$
Time, $t = 20$ s

Now, in OA part, if final velocity, $v' = 15 \text{ ms}^{-1}$ and time, OX = t′ then,

$$t' = \frac{v' - u}{a} = \frac{15 - 0}{1.5} = 10 \text{ s}$$ **(Ans.)**

d From the stem, initial velocity at point B, $u = 30 \text{ ms}^{-1}$
Final velocity at point E, $v = 0 \text{ ms}^{-1}$
In this case, time, $t = (50 - 20)$ s $= 30$ s
Acceleration of BC part, $a_1 = \frac{0 - 15}{30 - 20} = -1.5 \text{ ms}^{-2}$
Again, acceleration of DE part, $a_2 = \frac{0 - 15}{50 - 40} \text{ m/s}^2 = -1.5 \text{ m/s}^2$
$\therefore a_1 = a_2 = -1.5 \text{ m/s}^2$
The car will move in uniform deceleration if it comes directly from B to E.

In this case, $a = \frac{v - u}{t} = \frac{0 - 30}{30} = -1 \text{ ms}^{-1}$

$\therefore \frac{a}{a_1} = \frac{-1}{1.5} = -0.667$
or, $a = -0.667\, a_1$
The car will have negative acceleration if it comes directly from B to E which is 0.667 times to the previous acceleration.

Ques. ▶4 A car started moving from rest for 6 sec at 2ms^{-2} uniform acceleration and then started moving at uniform speed for 1min. *[All Board-18 ❙Ques. No.-1]*

a. What is deceleration? 1
b. Show that, force is a resultant quantity. 2
c. Determine the distance travelled in uniform acceleration. 3
d. What would be the total time if the total distance in the stem was travelled with 2ms^{-2} acceleration? 4

Answer to the question no. 4

a The decreasing rate of velocity of a body with time is called deceleration.

b We know,

$$\text{force} = \text{mass} \times \text{acceleration} = \text{mass} \times \frac{\text{velocity}}{\text{time}} = \text{mass} \times \frac{\text{displacement}}{(\text{time})^2}$$

Here, mass displacement and time is fundamental quantity. Therefore, force is a resultant quantity as it is made up of more than one fundamental quantity.

c Here, initial velocity of car, $u = 0 \text{ ms}^{-1}$
time of travelling with uniform acceleration, $t = 6$s
uniform acceleration, $a = 2 \text{ ms}^{-2}$
$\therefore$ if the distance travelled with uniform acceleration is s,

$$s = ut + \frac{1}{2}at^2 = (0 \times 6 + \frac{1}{2} \times 2 \times 6^2)\text{m} = 36\text{m}$$ **(Ans.)**

d According to the stem,
Initial velocity of car, $u = 0 \text{ ms}^{-1}$
time of travelling with uniform acceleration, $t_1 = 6$ sec
uniform acceleration, $a = 2 \text{ms}^{-2}$
Time of moving at uniform speed, $t_2 = 1$ min $= 60$ sec
From part 'C',
Distance travelled with uniform acceleration, $s = 36$ m
Now, if velocity after time t_1 is v,
$v = u + at_1 = (0 + 2 \times 6) \text{ ms}^{-1} = 12 \text{ ms}^{-1}$
$\therefore$ If distance travelled at time t_2 is s_1,
$s_1 = vt_2 = (12 \times 60)\text{m} = 720$ m
$\therefore$ Total distance travelled, $s_2 = s + s_1 = (36 + 720)\text{m} = 756$ m
Let, it would take time t_3 to travel s_2 distance in a uniform acceleration.

$\therefore s_2 = ut_3 + \frac{1}{2} at_3^2$

or, $756 = 0 \times t_3 + \frac{1}{2} \times 2 \times t_3^2$
or, $756 = t_3^2$
$\therefore t_3 = 27.495$ sec
Therefore, it would take total 27.495 sec time to travel the total distance in the stem in 2 ms^{-2} uniform acceleration.

Chapter-3
Force

Ques.▶1 Mass of an object is 5 kg and its position is steady. Now 5N force acts on this object for 4s. After 4s again 10N force acts on this object for 4s.

[D.B.-20 ❙ Ques. No.-8]

a. What is called wave? 1
b. Write the characteristics of the image which created in the plane mirror. 2
c. Determine the distance for first 8s of the object. 3
d. Analyze the motion of the object by drawing velocity vs time graph according to the information of the stem. 4

Answer to the question no. 1

a Wave is a process of transferring energy from one place to another through a medium, where the particles of the medium can oscillate about their position but are not displaced permanently from there.

b The characteristics of the image formed on a simple mirror are as follows:
1 Equal distance from the mirror
2 virtual image
3 same length
4 erect

c 5N force acts on the object for first 4s.

Accleration, $A_1 = \frac{F}{m} = \frac{5}{5} = 1ms^{-2}$

Distance covered is first 4s, $s_1 = ut + \frac{1}{2}at^2$

$= 0 + \frac{1}{2} \times 1 \times 4^2$

$= 8m$

Velocity after 4s, $v_1 = u + at$

$= 0 + 1 \times 4$

$= 4ms^{-1}$

After first 4s, is the next 4s, 10N force acts on body.

Acceleration, $a_2 = \frac{10}{5} = 2ms^{-2}$

Distance covered is next 4s, $s_2 = w + \frac{1}{2}at^2$ [$u = v_1$]

$= 4 \times 4 + \frac{1}{2} \times 2 \times 4^2$

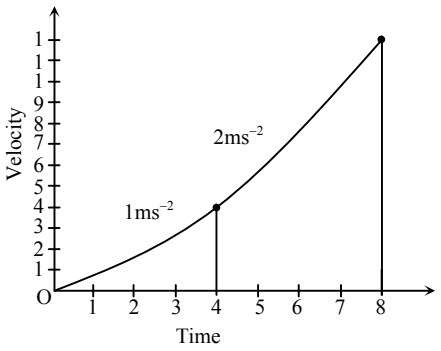
$= 32m$

Potal distance covered = $s_1 + s_2$

$= 8 + 32$

$= 40m$

d From (c), the body accelerates from rest at uniform acceleration for first 45 and obtains a velocity of $4ms^{-1}$. In the meantime, the body covers a distance of 8m. In the next 4s, the velocity increases from $4ms^{-1}$ to ($v_2 = v_1 + a_2t = 4 + 2 \times 4 = 12ms)^{-1}$. In the meantime the body covers a distance of 32m. So, the first 8s the body covers a distance of total 40m. In the first 4s and next 4s, $1ms^{-2}$ and $2ms^{-2}$ acceleration act on the body respectively.



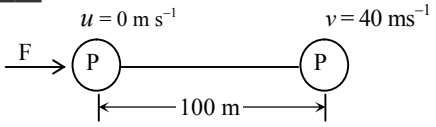
$\Delta OAC = \frac{1}{2} \times 4 \times 4 = 8$

Trapizoid ABDC $= \frac{1}{2}(4 + 12) \times 4$

$= 32$

The area of v-t graph indicates distance.
So, total distance = 32 + 8 = 40m.

Ques.▶2



P object's mass is 5 kg
Here, resistance force is 10 N *[J.B.-17 ❙ Ques. No.-2]*

a. Write down the Third law for a free-falling object. 1
b. Explain why an electric fan does not stop rotating right after the switch is turned off. 2
c. Determine *F*. 3
d. If after the object crosses 100 m the applied force is removed, determine the total time it needs to stop. Explain mathematically. 4

Answer to the question no. 2

a For an object freely falling from a stationary state, the distance it covers at a specific time (h) is squarely proportional to the time (t). In other words, $h \propto t^2$.

b An electric fan does not stop right after its switch is turned off. Because of its moving inertia, it shows a tendency of moving and that is why it moves a little longer even after the switch is turned off. And at last, because of air resistance, it stops moving.

c Given that,

Object P's initial velocity, $u = 0\ ms^{-1}$
Final Velocity, $v = 40\ ms^{-1}$
Displacement, $s = 100$ m
Mass of P, $m = 5$ kg
Resistance force, $F' = 10$ N
Applied force, $F = ?$

We know that,

$$v^2 = u^2 + 2as$$

$$\Rightarrow a = \frac{v^2 - u^2}{2s} = \frac{(40\text{ m s}^{-1})^2 - (0\text{ m s}^{-1})^2}{2 \times 100\text{ m}}$$

$$\therefore a = 8\text{ m s}^{-2}$$

$\therefore$ Applied force, $F = ma + F' = 5\text{ kg} \times 8\text{ m s}^{-2} + 10\text{ N}$

$= 50\text{ N}$ **(Ans.)**

d Given that, for $s_1 = 100$ m displacement,

Initial velocity, $u = 0\text{ ms}^{-1}$

Final velocity, $v = 40\text{ ms}^{-1}$

Time, $t_1 = ?$

We know that,

$$s_1 = \frac{u+v}{2} t_1 = \frac{0 + 40\text{ m s}^{-1}}{2} t_1 = 20\text{ ms}^{-1} \times t_1$$

$$\therefore t_1 = \frac{100\text{ m}}{20\text{ m s}^{-1}} = 5\text{ s}$$

After the applied force is removed, force of resistance will work on the object. It means, acting force, $F = -10$ N

So, acceleration, $a = \frac{F}{m} = \frac{-10\text{ N}}{5\text{ kg}} = -2\text{ ms}^{-2}$

In this case, Initial velocity, $u = 40\text{ ms}^{-1}$

Final velocity, $v = 0\text{ ms}^{-1}$

If the time between the applied force is removed and the object stopping is t_2 we have,

$$a = \frac{v-u}{t_2}$$

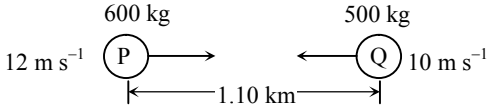
$$\therefore t_2 = \frac{0\text{ m s}^{-1} - 40\text{ m s}^{-1}}{-2\text{ m s}^{-2}}$$

$= 20$ s

$\therefore$ So, total time, $t = t_1 + t_2 = (5 + 20)$ s

$= 25$ s **(Ans.)**

Ques. ▶3



There is a collision between two cars P and Q after running a distance. As a result, the combined car moves together with a velocity 2ms^{-1} toward Q.

[B.B.-17 ▮Ques. No.-2]

a. What is called balanced force? 1

b. Explain the effect of force on the shape of a body. 2

c. At what time will the car P and Q meet together? 3

d. The incidence supports the law of conservation of momentum but not the Kinetic energy − Explain with mathematical logic. 4

Answer to the question no. 3

a If more than one force works on one object and their resultant force is zero or we can say that no acceleration is formed in that object, then the force that creates this equilibrium is known as balanced force.

b If force is applied to an object but its motion state remains same then its shape or size can change because of force applied. For example, if a plastic bottle is pressed with enough force it will get distorted or if a rubber is pulled from two ends its length will increase and get thinner. In these cases, their shape changed because of force applied.

For some cases, this change in shape is permanent and in other cases it is temporary. Of the two examples, distortion of plastic bottle is permanent but the rubber will get back its original shape if we stop pulling it. So, distortion for runner here is temporary.

c Given that,

P's velocity, $v_P = 12\text{ ms}^{-1}$

Q's velocity, $v_Q = -10\text{ ms}^{-1}$ [at the opposite direction of P]

Distance between P and Q = 1.10 km = 1100 m

Suppose that, after they started moving, they will meet at x distance from P after t time.

So, distance covered by P, $x = v_P t$

Distance covered by Q, $1100 - x = v_Q t$

So, $1100 = v_P t + v_Q t = (12 + 10)\, t = 22\, t$

$$\therefore t = \frac{1100}{22}\text{ s} = 50\text{ s}$$ **(Ans.)**

d Given that,

Mass of P, $m_1 = 600$ kg

Mass of Q, $m_2 = 500$ kg

Initial velocity of P, $u_1 = 12\text{ ms}^{-1}$

Initial velocity of Q, $u_2 = -10\text{ ms}^{-1}$

Combined velocity of P and Q, $v = 2\text{ ms}^{-1}$

Total momentum before collision $= m_1u_1 + m_2u_2 = 600 \times 12 + 500(-10)$

$= 2200\text{ kg ms}^{-1}$

Total momentum after collision $= m_1v + m_2v = 600 \times 2 + 500 \times 2$

$= 2200\text{ kg ms}^{-1}$

As the total momentum before and after collision is equal, so we can say that this collision supports the law of conservation of momentum.

Again,

Total kinetic energy before collision $= \frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2$

$= \frac{1}{2} \times 600 \times 12^2 + \frac{1}{2} \times 500 \times 10^2$

$= 43200\text{ J} + 25000\text{ J}$

$= 68200\text{ J}$

Total kinetic energy after collision $= \frac{1}{2} m_1 v^2 + \frac{1}{2} m_2 v^2$

$= \frac{1}{2} \times 600 \times 2^2 + \frac{1}{2} \times 500 \times 2^2$

$= 1200\text{ J} + 1000\text{ J}$

$= 2200\text{ J}$

As the total kinetic energy before and after collision is not equal so kinetic energy is not conserved here.

Chapter-4
Work, Power and Energy

Ques. ▶1 **Scene-1:** With a machine, 500kg of water was raised 50m height in 5 minutes. The efficiency of the machine is 45%.

Scene-2 : An object of 4kg mass was thrown upward with velocity $40ms^{-1}$. [$g = 9.8ms^{-2}$] *[D.B.-20 ❙Ques. No.-6]*

a. What is uniform acceleration? 1
b. Explain—Biomass is called renewable energy. 2
c. From scene-2 at what height the potential energy is double to the kinetic energy? 3
d. What will be the changing spent energy of the machine when its efficiency increases 10%? Analyze mathematically. 4

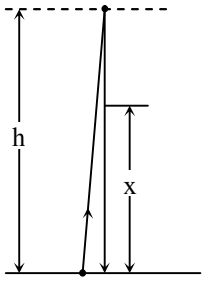
Answer to the question no. 1

a Uniform acceleration means that the change in velocity per unit of time is always the same in terms of magnitude and direction.

b Biomass is considered a renewable energy source because its inherent energy comes from the sun and because it can regrow in a relatively short time. Trees take in carbon dioxide from the atmosphere and convert it into biomass and when they die, it is released back into the atmosphere. biomass is called the source of renewable energy because the trees can be grown again. It is not lost forever from the world like oil, gas or coal.

c Let, the maximum height of the object thrown upward be h.

At x height, the potential energy is nouble to the kinetic energy.



m = 4kg
k = 40m/s
$g = 9.8m/s^2$

We know that,

$v^2 = u^2 + 2gs$

or, $v^2 = u^2 - 2gh$

or, $0^2 = (40)^2 - 2 \times 9.8 \times h$

$= h = \frac{40^2}{2 \times 9.8} = 81.63m$

Now, According to the question,

$E_P = 2E_k$

or, $mgx = 2.\frac{1}{2} mr^2$

or, $mgx = 2.\frac{1}{2} m (u^2 - 2gx)$

or, $9.8x = 40^2 - 2 \times 9.8 \times x$

or, $29.4x = 1600$

$\therefore x = 54.42m$

Therefore, at 54.42m from the ground the polential energy 7 the object will be double to the kinitic energy.

d Given that,

mass of water raised is, m = 500kg

height, h = 50m

time required, t = 5minutes

$= (5 \times 60)sec$

$= 300sec$

Efficiency of the machine, $\eta_1 = 45\%$

Power of the machine, $P_1 = \frac{mgh}{\eta_1 \times t}$

$= \frac{500 \times 9.8 \times 50}{0.45 \times 300}$

$= 1814.8W$

When the efficiency is increaced by 10%

$\eta_2 = (45 + 10)\% = 55\%$

Therefore, power of the machine,

$P_2 = \frac{mgh}{\eta_2 \times t}$

$= \frac{500 \times 9.8 \times 50}{0.55 \times 300}$

$= 1484.8W$

Therefore the change in spend energy is

$\Delta E = (P_1 - P_2) \times t$

$= (1814.8 - 1484.8) \times 300$

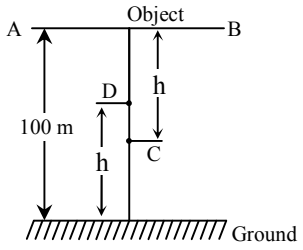
$= 99000joclce$

$= 99kj.$

Therefore increased efficiency will cause a reduction of 99kj of energy.

Ques. ▶2 **Scenario-1 :** An object is thrown vertically upward with a velocity 2Q ms^{-1}. Acceleration due to gravity of the place is $9.8ms^{-2}$.

Scenario-2:



The mass of the object in figure is 50g. And the object is allowed to fall freely. At C kinetic energy will be doubled of potential energy. *[M.B.-20 ❙Ques. No.-2]*

a. What is called fluid friction? 1
b. Why is the bottom surface of shoe designed with grooves? 2
c. How much time will the object take to reach the maximum height in scenario-1? 3
d. In case of scenario-2 the total energy of the body at point C and D remains same. Give your opinion through analysis. 4

Answer to the question no. 2

a The frictional force that is experienced by an object when it moves in a liquid or gaseous substance is called fluid friction.

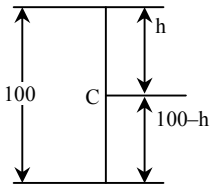
b The bottom of shoes has grooves because grooves allow small items such as sand or mud or water some place to go sooner, allowing the surface to regain contact with the ground sooner as it slides.

c At minimum height the velocity be zero

We Know,
$v = u - gt$
$\Rightarrow t = \frac{u - v}{g}$
$= \frac{20 - 0}{9.8}$
$= 2.04$ sec **(Ans.)**

Given,
Initial velocity,
$u = 20 ms^{-1}$
Acceleration due to gravity, $g = 9.8\ m/s^2$
time, $t = ?$

d



According to the question at point C
$E_k = 2E_p$

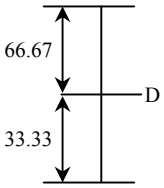
Given,
Mss, $M = 50g$
$= 50 \times 10^{-3} kg$

$\Rightarrow \frac{1}{2} mv^2 = 2.mgh$
$\Rightarrow \frac{1}{2} m \{u^2 + 2g (100 - h)\} = 2mgh$
$\Rightarrow \frac{1}{2} m\ 2g(100 - h)\} = 2mgh$
$\Rightarrow mg (100 - h) = 2mgh$
$\Rightarrow 100 - h = 2h$
$\Rightarrow h = \frac{100}{3}$
$= 33.33m$

Potential energy at Point C,
$E_{P_C} = mgh$
$= 50 \times 10^{-3} \times 9.8 \times 33.33 = 16.33j$

Kinetic energy at point C, $E_{KC} = \frac{1}{2} m \times 2g (100 - 33.33)$
$= 50 \times 10^{-3} \times 9.8 \times 66.67$
$= 32.67j$

$\therefore$ Total energy at point C, $E = E_{P_C} + E_{K_C}$
$= 16.33 + 32.67j = 49J$



Potential energy at point D, $= mg (100 - h)$
$= 50 \times 10^{-1} \times 9.8 (100 - 33.33)$
$= 32.67g$

Kinetic enegrgy at point D, $E_{K_D} = \frac{1}{2} mv^2$
$= \frac{1}{2} m (u^2 + 2gh)$
$= \frac{1}{2} \times 50 \times 10^{-3} (0 + 2 \times 9.8 \times 33.33)$
$= 16.33J$

$\therefore$ Total energy at point D, $E_D = E_{P_D} + E_{K_D}$
$= 32.67 + 16.33$
$= 49J$

$\therefore$ Total energy at point C and D remain same.

Ques. ▶3 An object of mass 20kg is released to fall freely from a place at a height 40m from the ground.

[R.B.-19 ❙Ques. No.-3]

a. What is efficiency? 1
b. Explain why the unit of energy and work is same. 2
c. At what height from the ground will the potential energy be one third of kinetic energy? 3
d. Will the principle of conservation of energy follow at maximum height and after 2 sec of falling? Analyse your opinion through logic. 4

Answer to the question no. 3

a The ratio of the amount of work done by a machine and total given energy is called the efficiency of that machine.

b Ability to do work is energy. Doing work means transforming energy from one state to another state. In this case, the amount of work done is equal to the amount of energy transformed. This means that total amount of work done by body is energy. Since, energy of a body is measured from the amount of work done, so unit of work and energy is same and it is joule (J).

c It is given that,
Height of the body from ground, $h = 40$ m
Mass of body, $m = 20$ kg
Initial velocity, $u = 0\ ms^{-1}$

Let, potential energy of the body at x m height from the ground is one-third of its kinetic energy.

According to the question, $v = \frac{1}{3} T$
or, $3V = T$
or, $3.m.gx = \frac{1}{2} mv^2$
or, $3mgx = \frac{1}{2} m \{u^2 + 2g (h - x)\}$

or, $3gx = \frac{1}{2} \times 2\,g\,(h - x)$

or, $3x = h - x$

or, $4x = h$

or, $x = \frac{h}{4}$

or, $x = \frac{40\text{ m}}{4}$

$\therefore x = 10$ m **(Ans.)**

d It is given that, mass of body, m = 20 kg

Height, h = 40 m

Initial velocity of body, $u = 0\ ms^{-1}$

Kinetic energy at maximum height, $T_1 = 0$ J

And potential energy, $v_1 = mgh$

$= 20 \times 9.8 \times 40$

$= 7840$ J

$\therefore$ Total energy at maximum height, $E_1 = T_1 + v_1$

$= 0$ J $+ 7840$ J

$= 7840$ J

Again, travelled distance of body after the first 2s of fall,

$x = ut + \frac{1}{2} gt^2 = 0 \times 2 + \frac{1}{2} \times 9.8 \times 2^2$

$= 19.6$ m

Height from the ground at that time, $h' = 40 - x$

$= (40 - 19.6)$ m

$= 20.4$ m

Again, velocity of body after the first 2s of fall,

$v = u + gt$

$= 0 + 9.8 \times 2$

$= 19.6\ ms^{-1}$

$\therefore$ Kinetic energy, $T_2 = \frac{1}{2} mv^2$

$= \frac{1}{2} \times 20 \times (19.6)^2 = 3841.6$ J

And potential energy, $v_2 = mgh'$

$= 20 \times 9.8 \times 20.4 = 3998.4$ J

$\therefore$ Total energy, $E_2 = T_2 + v_2$

$= 3841.6$ J $+ 3998.4$ J $= 7840$ J

$\therefore E_1 = E_2$

Therefore, the law of conservation of energy is followed.

Ques. ▶4 A motor capable of lifting water at a height of 20m in 1 minute. The power of the motor is 1.96 kw and efficiency is 50%. But when the motor is damage, a man is lifting same amount of water in same height by using a pot. The capability of the water of the pot is 20kg and mass of the man is 48kg. The man is capable of lifting same amount of water takes time 2 minutes. The mass of the pot is 2kg. *[Dj.B.-19 ❙ Ques. No.-2]*

a. What is potential energy? 1

b. Why the nuclear reaction is not environmentally friendly? Explain. 2

c. Determine the potential energy of the man with full of water pot at maximum height. 3

d. Whether it will change the efficiency of the two motors when you installed a new motor and the motor is lifting same amount of water in 30s. Analyse. 4

Answer to the question no. 4

a When the normal state or position of a body is changed to another state or position then the ability of work obtained by the body is called potential energy.

b There is no emission of carbon dioxide in a nuclear power plant. But nuclear wastages are very radioactive and these have to be preserved for millions of years for their radioactivity to reach a safe level which is not hazardous for the environment. Though nuclear power plant is very safe due to modern technology, sometimes owing to people's mistakes or natural calamities major accident happens to create a fatal disaster. These are why, nuclear reaction is not environment friendly.

c Here, mass of pot with water, $m_1 = (20 + 2)$ kg $= 22$ kg

Mass of person, $m_2 = 48$ kg

Height, h = 20m

$\therefore$ Potential energy, $V = (m_1 + m_2)\,gh$

$= (22 + 48) \times 9.8 \times 20$ J

$= 13720$ J **(Ans.)**

d Here, power of 1st motor, $P_{in} = 1.96$ kW $= 1960$ W

Efficiency of 1st motor, $\eta = 50\% = 0.5$

Time required to collect water, t = 1 min = 60 s

$\therefore$ Power efficiency, $P_{out} = \eta P_{in}$

$= 0.5 \times 1960$W

$= 980$ W

Let, new motor has P'_{in} power and η' efficiency

$\therefore$ Power efficiency, $P'_{out} = \eta' P'_{in}$

If time required to collect water is t′ then,

$P'_{out} = \frac{mgh}{t'}$

$P_{out} = \frac{mgh}{t}$

$\therefore \frac{P'_{out}}{P_{out}} = \frac{t}{t'} = \frac{60}{30} = 2$

or, $\frac{\eta' P'_{in}}{\eta P_{in}} = 2$

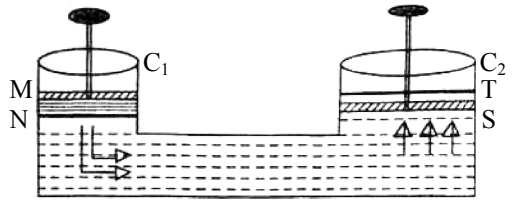
or, $\eta' = 2 \frac{P_{in}}{P'_{in}} \eta$

or, $\eta' = \frac{P_{in}}{P'_{in}} \times 100\%$; i [$\because \eta = 50\%$]

Since efficiency can never be 100% or more. So, $P'_{in} > P_{in}$. It is not possible to determine efficiency if the value of P_{in} is unknown. Therefore, a motor with power more than 1.96 kW should be used to get $\frac{1.96}{P'_{in}} \times 100\%$ efficiency.

Chapter-5
State of Matter and Pressure

Ques. ▶1



In figure the radii of the cylinders C_1 and C_2 are 3cm and 6 cm respectively. If 1000 N force is applied on the piston of C_1, it is moved from M to N at distance 6 cm. As a result the piston of C_2 is moved 1 cm from position S to T. *[M.B.-20 ❙Ques. No.-3]*

a. What is called pressure? 1
b. Explain why the unit of stress is same as the unit of modulus of elasticity. 2
c. Find out the experienced force on the piston of cylinder C_2. 3
d. Energy is not increased in the event of the above stem. Express your opinion through analysis. 4

Answer to the question no. 1

a The force exerted perpendicularly to unit area of a body is called pressure.

b It is also known as 'elastic modulus', it is a measured value that represents a material's resistance to elastic deformation, i.e., it's 'stretchiness'. It applies only to non-permanent deformation when under the effect of stress.The SI unit for the Modulus of Elasticity is the Pascal. Stress means the force is applied per unit area.

$\text{Stress} = \frac{F}{A}$.

The unit of the stress is Nm^{-2} or Pascal(Pa).
That's why the unit of the stress is the same as unit of the modulus of elasticity.

c

We know

$\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$\Rightarrow F_2 = F_1 \times \frac{A_2}{A_1}$

$= 1000 \times \frac{2.827 \times 10^{-3}}{7.0686 \times 10^{-4}}$

$= 3999.21$ N

Here,
Force applied on piston C_1 is
$F_1 = 1000$N

$A_1 = \pi \left(\frac{d_1}{2}\right)^2 = 3.1916 \times \left(\frac{3 \times 10^{-2}}{2}\right)^2$

$= 7.0686 \times 10^{-4} m^2$

Area of Piston C_2, $A_2 = \pi\left(\frac{d_2}{2}\right)^2$

$= 3.1416 \times \left(\frac{6 \times p^{-2}}{2}\right)^2$

$= 2.827 \times 10^{-3} m^2$

Force of Piston C_2 F_2 = ?

The experienced forced on the piston of cylinder C_2 is 3999.21N

d We Know,
Work done = Energy
Work done by piston of $C_1 = F_i x_1$

$1000 \times \frac{6}{100}$

$= 60$J

Work done by piston of $C_2 = F_2.x_2$

$= 3999.21 \times \frac{1}{100}$

$= 39.992$J

∴ As the work done (energy) is not increased. The statenent is right.

Ques. ▶2 In a hydraulic press the ration of diameters of larger and smaller piston is 5:1. If the smaller piston travels some distance, the larger piston gains a force of 300N. *[Dj.B.-20 ❙Ques. No.-4]*

a. What is buoyancy? 1
b. Why it is easy to make a hole with a sharp pin in a paper. 2
c. Find the applied force on the smaller piston. 3
d. According to the stem, the works done are same of the two pistons — Analyze with the help of "Principle of multiplication of force." 4

Answer to the question no. 2

a Buoyancy is an upward force exerted by a fluid that opposes the weight of an immersed object.

b It is easy to make a hole with a sharp pin in a piece of paper because of acting pressure.

We know, $P = \frac{F}{A}$.

The area of the sharp pin is very less, so the pressure will be increased.That's why it is easier to make a hole with it in a paper.

c If the ratio of diameter =5:1,
The ratio of area=25:1
Here,
$F_2 = 300$N
We know,

$\frac{F_2}{F_1} = \frac{A_2}{A_1}$

Or, $F_1 = \frac{F_2}{\frac{A_2}{A_1}}$

$= \frac{300}{25}$ N = 12N **(Ans.)**

d Work done on small portion, $W_1 = F_1 \times X_1$
Work done on large portion $W_2 = F_2 \times X_2$

As, pressure, $P = \frac{F_1}{A_1} = \frac{F_2}{A_2}$

$F_1 = P \times A_1$
and $F_2 = P \times A_2$
Since the volume of water remains constant, the volume of empty space also remains constant.
So, $A_1 \times X_1 = A_2 \times X_2$
Or, $W_1 = W_2$
Therefore, $W_1 = W_2$

Ques. ▶3 The densities of the liquids in the pot 'A' and pot 'B' are 800 kgm^{-3} and 1260 kgm^{-3} respectively. The height of liquid in pot A is 50 cm. Due to dip an object of mass 250gm in liquid in pot A it loses of weight of 1.96 N. *[D.B.-19 ❙ Ques. No.-3]*

a. What is called buoyancy? 1
b. Though heat is required to convert one state into another state of matter but temperature does not change.— Why? 2
c. Find the pressure of liquid at the bottom of the pot A. 3
d. What will happen if the object is fallen in liquid in pot B? 4

Answer to the question no. 3

a Buoyancy is an upward force exerted by a fluid that opposes the weight of an immersed object.

b While changing phase kinetic energy of an element does not change though it absorbs heat. As a result, the temperature of the element does not change while changing phase. When heat is applied, the internal energy of the element increases. This increase of internal energy determines the raise of temperature. During the change of phase, the heat absorbed or extracted is used to loosen or strengthen the intermolecular bonds of the molecules. But the nit kinetic energy is not changed. So, the temperature cannot change because applied heat cannot make the molecules move further.

c Given,
The density of liquid kept in A, $\rho = 800\ kgm^{-3}$
Height of liquid, $h = 50\ cm$
$= 0.5\ m$
Gravitational Acceleration, $g = 9.8\ ms^{-2}$
Pressure, $h = ?$
We know,
$h = h\rho g$
$= 0.5 \times 800 \times 9.8$
$= 3920\ N$ **(Ans.)**

d From the stem,
Mass of the body, $m = 250\ gm$
$= 0.25\ kg$
Density of liquid in A, $\rho_A = 800\ kgm^{-3}$
Density of liquid in B, $\rho_B = 1260\ kgm^{-3}$
Weight lost by the body when dipped in vessel A= 1.96 N
So, Buoyancy applied by the liquid in A on the body,
$V\rho_A g = 1.96$; [V =Volume of the body]
Or, $V = \frac{1.96}{800 \times 9.8}$
$\therefore V = 2.5 \times 10^{-4}\ m^3$
Again Buoyancy applied by the liquid in B on the body,
$= V\rho_B g$
$= 2.5 \times 10^{-4} \times 1260 \times 9.8$
$= 3.087\ N$
Therefore, Weight of liquid displaced in vessel B = 3.087 N
$\frac{\text{Weight of the body}}{\text{Weight of displace water having the same volume as the body}} = \frac{0.25 \times 9.8}{3.087}$
$\therefore$ Weight of the body $= \frac{50}{63}$
Weight of displace water having the same volume as the body.
So, if the body is dipped in vessel B it will float with $\frac{50}{63}$ of volume of it immersed in water.

Ques. ▶4 A rectangular object with a mass of 200g has an area and height of 24 cm^2 and 3 cm. The weight of object in kerosene is 1.4N. It is to be mentioned that, density of kerosene is 800 kgm^{-3}. *[All Board-18 ❙ Ques. No.-6]*

a. What is buoyancy? 1
b. Why is it easier to swim in the sea than in the river? 2
c. How much is the density of the element of the object? 3
d. Mathematically analyze if the given stem follows the Archimedes Law. 4

Answer to the question no. 4

a A body partially or completely submerged in a liquid or gas at rest is acted upon by an upward force by the liquid of gas, this is called buoyancy.

b The density of seawater is more than river water. As a result, buoyancy force of seawater is more than river water. It is easier to swim in the sea than in the river because of this buoyancy force.

c Here,
Mass of rectangular object, $m = 200g$
$= 200 \times 10^{-3} kg$
Area of rectangular object, $A = 24\ cm^2$
$= 24 \times 10^{-4} m^2$
And height, $h = 3\ cm$
$= 3 \times 10^{-2} m$
$\therefore$ Volume of rectangular object, $V = Ah$
$= 24 \times 10^{-4} \times 3 \times 10^{-2} m^3$
$= 7.2 \times 10^{-5} m^3$
If the density of the element of the rectangular object is ρ,
$\rho = \frac{m}{V}$
$= \frac{200 \times 10^{-3}}{7.2 \times 10^{-5}}\ kgm^{-3}$
$= 2777.78\ kgm^{-3}$ **(Ans.)**

d Here,
Mass of rectangular object, $m = 200g$
$= 200 \times 10^{-3} kg$
$\therefore$ Weight of rectangular object in air, $W_1 = mg$
$= (200 \times 10^{-3} \times 9.8)N$
$= 1.96N$
From part 'C',
Volume of rectangular object, $V = 7.2 \times 10^{-5} m^3$
Density of kerosene, $\rho = 800\ kgm^{-3}$
$\therefore$ Buoyancy force acting on the object completely immersed in kerosene,
$F = V\rho g$
$= (7.2 \times 10^{-5} \times 800 \times 9.8)N$
$= 0.56N$
$\therefore$ Weight of object in kerosene $= (1.96 - 0.56)N$
$= 1.4N$
According to the stem, weight of object in kerosene is 1.4N.
Therefore, the stem follows the Archimedes Law.

Chapter-6
Effect of Heat on Matter

Ques. ▶1 A solid object with a mass of 3kg and 15°C temperature is kept beside a burning stove at 200°C temperature. As a result, after a certain time, it achieves a temperature of 86°F. Specific heat of the element of the object is 361 $Jkg^{-1}K^{-1}$ and latent heat of ice is 336000 Jkg^{-1}. *[All Board-18 ❙Ques. No.-7]*

a. What is specific heat? 1

b. What does coefficient of linear expansion of steel $11 \times 10^{-6}K^{-1}$ mean? 2

c. How much heat has been absorbed for the object to reach 86°F temperature? 3

d. After the mentioned time, if the object is put in 500g melted icewater, what will be the maximum temperature of the mixture? Mathematically analyze. 4

Answer to the question no. 1

a The amount of heat required to increase the temperature of a body of mass 1 kg by 1 K is called the specific heat.

b Steel's coeffecient of linear expansion being $11 \times 10^{-6}K^{-1}$ means that, if the temperature of a 1m long steel rod is increased by 1K, its length increases by 11×10^{-6}m.

c Here,

Mass of object, m = 3kg

Specific heat of the element of the object,

$S = 361\ Jkg^{-1}K^{-1}$

Initial temperature of object, $\theta_1 = 15°C$

And final temperature, $\theta_2 = 86°F$

$= \frac{5}{9}(86 - 32)°C$

$= 30°C$

$\therefore$ Temperature increase, $\Delta\theta = \theta_2 - \theta_1$

$= 30°C - 15°C$

$= 15°C = 15K$

$\therefore$ If the heat absorbed by the object is Q, $Q = mS\Delta\theta$

$= (3 \times 361 \times 15)J$

$= 16245J$ **(Ans.)**

d Here,

Mass of object, $m_1 = 3kg$

Specific heat of the element of the object,

$S_1 = 361\ Jkg^{-1}K^{-1}$

Mass of melted icewater, $m_2 = 500g$

$= 0.5kg$

And initial temperature, $\theta_1 = 0°C = 273K$

We know, specific heat of water, $S_2 = 4200\ Jkg^{-1}K^{-1}$

From part 'C', temperature of object after the mentioned time, $\theta_2 = 30°C$

$= 303K$

Let, maximum temperature of mixture is θ_m

Here, the object will lose heat and melted icewater will gain heat.

$\therefore$ Heat lost by the object, $Q_1 = m_1S_1(\theta_2 - \theta_m)$

And heat gained by the melted icewater,

$Q_2 = m_2S_2(\theta_m - \theta_1)$

According to the principles of calorimetry, $Q_1 = Q_2$

$\therefore\ m_1S_1(\theta_2 - \theta_m) = m_2S_2(\theta_m - \theta_1)$

or, $3 \times 361 \times (303 - \theta_m) = 0.5 \times 4200 \times (\theta_m - 273)$

or, $328149 - 1083\ \theta_m = 2100\ \theta_m - 573300$

or, $2100\ \theta_m + 1083\ \theta_m = 328149 + 573300$

or, $3183\ \theta_m = 901449$

$\therefore\ \theta_m = 283.21K$

$= 10.21°C$

Therefore, maximum temperature of mixture is 283.21K or 10.21°C.

Ques. ▶2 The depth of a well is 3500cm, air temperature is 60°F. At this temperature, the velocity of sound is $343ms^{-1}$. *[D.B.-17 ❙Ques. No.-2]*

a. What is wave velocity? 1

b. Set the relationship between frequency and time period. 2

c. What is the temperature of that place in Celsius scale? 3

d. If any sound is produced at the mouth of the well, will echo be heard? Explain mathematically. 4

Answer to the question no. 2

a The distance travelled by a wave in a certain direction in one second is called wave velocity.

b The time required by an oscillating object to conclude a complete oscillation is called time period and the number of complete oscillations concluded by an oscillating object in one second is called frequency. If the time period of an oscillating object is *T* then,

Number of oscillations in *T* second = 1

$\therefore$ Number of oscillations in 1 second $= \frac{1}{T}$

This oscillation number in 1 second is frequency.

So, frequency, $f = \frac{1}{T}$

c From the stem,
Temperature in Fahrenheit scale, $F = 65°F$
Temperature in Celsius scale, $C = ?$
We know,

$$\frac{C}{5} = \frac{F-32}{9}$$

or, $9C = 5F - 160$

or, $C = \frac{5 \times 65 - 160}{9}$

$= 18.33°C$ **(Ans.)**

d From the stem,
Depth of well, $d = 3500$ cm $= 35$ m
Sound velocity in air, $v = 343$ ms^{-1}
Let, time required to hear echo $= t$
We know,

$$d = \frac{vt}{2}$$

or, $t = \frac{2d}{v} = \frac{2 \times 35}{343}$

$\therefore\ t = 0.2$ s > 0.1 s

Since the required time to hear the echo is more than the duration of the feeling of sound, echo can be heard if the sound is made at the top of the well.

Ques. ▶3

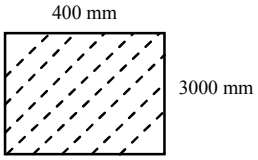


Figure : Metal piece

[R.B.-17 ❙ Ques. No.-3]

The surface area of the figure is increased by 0.1m^2 for the rise of temperature 30°C.

a. What is regelation? 1
b. Explain the plasma state of matter. 2
c. Find out the coefficient of linear expansion of the metal piece. 3
d. What will be the increase in temperature to increase the surface area of that metal by 6%? 4

Answer to the question no. 3

a The process of turning a solid matter to liquid using pressure and again turning it back to solid state by decreasing pressure is called regelation.

b The fourth state of matter is called plasma. This plasma is the gas ionized in extremely high temperature. A large source of plasma is the Sun. Aside from that, the other stars are also sources of plasma. The state of plasma occurs in thousands of degree Celsius temperatures. Like gas, plasma doesn't have any specific shape or volume. Plasma particles are electric conductors. Metallic matter is cut by plasma torch in factories.

c Given that, length of metallic piece, $L = 4000$ mm $= 4$ m
Width of metallic piece, $B = 3000$ mm $= 3$ m
Temperature increase, $\Delta\theta = 30°C = 30$ K
Area increase, $\Delta A = 0.1$ m^2
Initial area of metallic piece, $A_1 = L \times B = 4$ m $\times$ 3 m $= 12$ m^2

Co-efficient of area expansion, $\beta = \frac{\Delta A}{A_1 \Delta\theta}$

$= \frac{0.1\ \text{m}^2}{12\ \text{m}^2 \times 30\ \text{K}}$

$= 2.77 \times 10^{-4}\ \text{K}^{-1}$

If the co-efficient of linear expansion of the metallic piece is α,

$\beta = 2\alpha$

or, $\alpha = \frac{\beta}{2} = \frac{2.77 \times 10^{-4}\ \text{K}^{-1}}{2}$

$= 1.39 \times 10^{-4}\ \text{K}^{-1}$ **(Ans.)**

d From the 'c' part,
Initial area of metallic piece, $A_1 = 12$ m^2
Co-efficient of area expansion, $\beta = 2.77 \times 10^{-4}\ \text{K}^{-1}$
According to the question, area increase,

$$\Delta A = A_1 \times 6\% = 12\ \text{m}^2 \times \frac{6}{100} = 0.72\ \text{m}^2$$

If temperature increase is $\Delta\theta$,

$\beta = \frac{\Delta A}{A_1 \Delta\theta}$

or, $\Delta\theta = \frac{\Delta A}{A_1 \times \beta} = \frac{0.72\ \text{m}^2}{12\ \text{m}^2 \times 2.77 \times 10^{-4}\ \text{K}^{-1}}$

$= 216.6°C$

Therefore, the temperature needs to be increased by 216.6°C to increase the area of the metallic piece by 6%.

Ques. ▶4 24000J heat is applied to increase the temperature of a rod of length 1m having mass 3kg from 30°C to 50°C, whose expansion of length is 2.34×10^{-4}m. The expansion of the length of another similar rod is 2.2×10^{-4}m for the same change of temperature.

[Dj.B.-17 ❙ Ques. No.-3]

a. What is the unit of thermal capacity? 1
b. Explain the effect of pressure on the melting point. 2
c. Find the specific heat of the 1st rod. 3
d. What is the reason for the different value of linear expansion of these two rods? Explain with mathematical logic. 4

Answer to the question no. 4

a The amount of heat required to increase the temperature of an object by one unit is called the thermal capacity of that object.

b The melting point of a matter changes depending on the variation of the pressure on it. The change of melting point due to pressure can occur in two ways.

i. The matters that lose volume while transforming from solid to liquid (for example ice), their melting point decreases when pressure is increased or they melt in lower temperatures.
ii. The matters that gain volume while transforming from solid to liquid (for example wax), their melting point increases when pressure is increased or they melt in higher temperatures.

c From the stem,
Mass of 1st rod, $m = 3$ kg
Temperature difference, $\Delta\theta = (50 - 30)°C = 20°C = 20$ K
Heat applied, $Q = 24000$ J
Relative heat, $S = ?$
We know,
$Q = mS\Delta\theta$
or, $S = \frac{Q}{m\Delta\theta} = \frac{24000 \text{ J}}{3 \text{ kg} \times 20 \text{ K}} = 400 \text{ J kg}^{-1} \text{ K}^{-1}$ **(Ans.)**

d From the stem,
Initial length of the 1st and 2nd rod, $l = 1$ m
Length expansion of the 1st rod, $\Delta l_1 = 2.34 \times 10^{-4}$ m
Length expansion of the 2nd rod, $\Delta l_2 = 2.2 \times 10^{-4}$ m
Temperature increase of the two rods, $\Delta\theta = (50 - 30)°C = 20°C = 20$ K
So, length expansion coefficient of the 1st rod,

$$\alpha_1 = \frac{\Delta l_1}{l\Delta\theta} = \frac{2.34 \times 10^{-4} \text{ m}}{1 \text{ m} \times 20 \text{ K}} = 1.17 \times 10^{-5} \text{ K}^{-1}$$

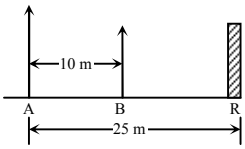
And length expansion coefficient of the 2nd rod,

$$\alpha_2 = \frac{\Delta l_2}{l\Delta\theta} = \frac{2.2 \times 10^{-4} \text{ m}}{1 \text{ m} \times 20 \text{ K}} = 1.1 \times 10^{-5} \text{ K}^{-1}$$

From mathematical analysis, $\alpha_1 > \alpha_2$
Therefore, since the length expansion coefficient of the two rods are different so length expansion of the two rods are different as well.

Chapter-7
Waves and Sound

Ques. ▶1



In the above figure 'A', 'B' and 'R' represent position of source of sound, observer and reflector respectively. Here the sound takes 0.143 second time to come at source 'A' after being reflected from 'R' [Speed of sound at 0°C is 330 ms^{-1}] *[R.B.-20 ❙Ques. No.-4]*

a. What is called pitch of sound? 1
b. Why is the speed of sound vary in air medium? Explain it. 2
c. Calculate the temperature of air in the mentioned place. 3
d. Does the listener of position 'B' hear an echo when sound is produced from source 'A'? Analyze mathematically. 4

Answer to the question no. 1

a The characteristic of musical sound by which the sound of the same intensity is sometimes heard and sometimes sharp is called pitch.

b The speed of sound at an ambient condition is 332m/s. However,the speed of sound varies in the air medium with the variation of air density and temperature. The speed of sound changes proportionately with temperature. Again as mass increases, density increases in a specific volume as a result speed of sound increases.

c According to the stem,
Speed of sound at 0°C (T_1), $v_1 = 330$m/s
Temperature, $T_1 = 0°C = 273$K
Distance, s = 25m
Temperature, $T_2 = ?$
We know,
In case of reflection, speed of sound, $2s = v_2 t$
Or, $v_2 = \frac{2s}{t}$
Or, $v_2 = \frac{2 \times 25}{0.143}$
Therefore,
$v_2 = 350$m/s.
We know, Speed of sound changes proportionately with temperature.
So, $\frac{v_2}{T_2} = \frac{v_1}{T_1}$
Or, $\frac{v_2}{T_2} = \frac{v_1}{T_1}$
Or, $T_2 = \frac{v_2 T_1}{v_1}$
Or, $T_2 = \frac{350 \times 273}{330}$
Or, $T_2 = 290$K $= 17°C$ **(Ans.)**

d According to the given stem,
The distance of the observer from the reflector,
BR = AR – AB = 25 – 10 = 15m
From section 'c' we have found that velocity of sound, V = 350m/s

We know,
In the case of reflection, speed of sound, 2s = vt

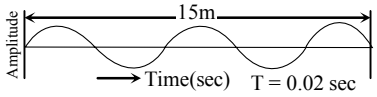
Or, $t = \frac{2s}{v}$

Or, $t = \frac{(2\times5)}{350}$

Therefore, t = 0.023s

We know, we can hear an echo only if the difference of source sound and reflected sound is more than 0.1s. From the above calculation, reflected sound reaches the observer before 0.1s. Therefore the observer cannot hear an echo.

Ques. ▶2



[Ctg.B.-20 ❙Ques. No.-6]

a. Define intensity of sound. 1
b. Why all reflected sound is not echo? Explain. 2
c. Calculate the velocity of the wave. 3
d. Explain by drawing a figure, how the above wave will propagate in air medium. 4

Answer to the question no. 2

a Intensity is a measure of sound energy that flows per second per unit area.

b Whenthe distance between reflecting surface and observer is 16.5m, then the reflected sound takes at least 0.1s to reach the observer. As a result, the observer can hear an echo. If the distance is less than 16.5m then the reflected sound reaches the observer in less than 0.1s. Then the observer cannot differentiate echo from the actual sound. So, not all reflected sound is an echo.

c According to the given stem,

Wavelength, $\frac{5\lambda}{2} = 15m$

So, $\lambda = 6m$

Time period, T = 0.02s

Therefore, frequency, $f = \frac{1}{T} = \frac{1}{0.02} = 50Hz$

So, velocity, $v = f\lambda = 50\times15m/s = 750m/s$ **(Ans.)**

d The wave mentioned in the stem is a transverse wave. In the case of transverse wave vibration of the wave does not take place along the direction of the velocity of the wave. The direction of vibration i.e. up and down of the particles is perpendicular to the velocity of the wave. The propagation of the wave is drawn below:

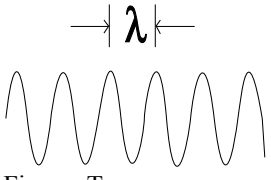
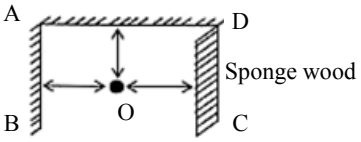


Figure: Transverse wave

Ques. ▶3



Temperature of air is 20°C

At point O, a person produced a sound loudly.

[R.B.-19 ❙Ques. No.-6]

a. What is wave? 1
b. Spring wave is longitudinal wave. — Explain. 2
c. Find out the minimum distance from O to AD to O hear an echo. 3
d. How many times will the person standing at point O hear echo at that temperature? Analyze your opinion with logic. 4

Answer to the question no. 3

a Wave is a process of transferring energy from one place to another through a medium, where the particles of the medium can oscillate about their position but are not displaced permanently from there.

b When a spring is pulled and let go, it oscillates backward and forward. This occurs when different parts of the spring contracts and expands and wave propagates through this. We know that if wave propagates through contraction and expansion and if the direction of the wave is parallel to the direction of the oscillation of the particles of the medium then that wave is called longitudinal wave. This is why wave of spring is also longitudinal wave.

c If the velocity of sound in air temperature is v, then if the minimum distance from O to AD to hear echo is d,

$d = \frac{vt}{2}$

$= \frac{t}{2}v$

$= \frac{t}{2}\times v_0\sqrt{\frac{T}{T_0}}$

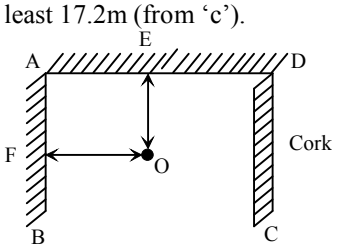
$= \frac{0.1}{2}\times 332\times\sqrt{\frac{293}{273}}$

= 17.2 m **(Ans.)**

Here,
Persistence of hearing, t = 0.1 s
Velocity of sound in 0°C, $v_o = 332\ ms^{-1}$
Temperature, T_0 = 0°C = 273 K
Temperature, T = 20°C = (20 + 273) K = 293 K

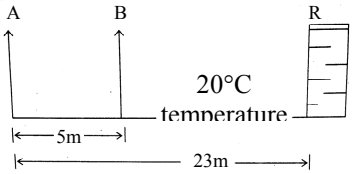
d No sound will reflect from the cork wall in the stem. Sound will reflect from only wall AB and AD.

Here, distance OE from O to AD and OF from O to AB should be at least 17.2m (from 'c').



If OE = OF which means the difference in distance of OE and OF is such that if while hearing echo from its wall in 0.1s, sound reflected from other wall reaches point O, then only one echo can be heard.
Now, if the difference in distance of OE and OF is at least d, so that reflected sound from the two walls reach point O within 0.1s, then two echoes will be heard.
In this case, d = 17.2 m (from 'c').

Ques. ▶4



A person at 'A' produces a sound of frequency 120 Hz, another person 'B' hears the echo. *[C.B.-19 ❙ Ques. No.-6]*

a. What is called intensity of sound? 1
b. Why sound is one kind of wave? Explain. 2
c. Determine the wavelength of the produced sound. 3
d. Is it possible to hear echo by the person at 'B' at temperature 40℃ for the same produced sound? Explain by your logic. 4

Answer to the question no. 4

a The amount of sound energy that flows per second per unit area is called sound intensity.

b When sound transmission occurs, the particles of the medium of the sound source propagate forward through contraction-expansion and it transfers energy from one place to other.

Again, wave is a process of transferring energy from one place to another through a medium, where the particles of the medium can oscillate about their position but are not displaced permanently from there.

This is why it can be said that, sound is a type of wave.

c If velocity of sound in air at 20°C temperature is v_2,

$$\frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}}$$

$$\therefore \quad v_2 = v_1\sqrt{\frac{T_2}{T_1}}$$

$$= 332\sqrt{\frac{293}{273}}$$

$$= 343.95 \text{ ms}^{-1}$$

Here,
Velocity of sound in 0°C temperature,
$v_1 = 332 \text{ ms}^{-1}$
Temperature, $T_1 = 0°C$
$= (0 + 273)$ K
$= 273$ K
Temperature, $T_2 = 20°C$
$= (20 + 273)$ K
$= 293$ K

If the wavelength of the sound wave is λ,

$$\lambda = \frac{v_2}{f}$$

$$= \frac{343.95}{120}$$

$$= 2.866 \text{ m } \textbf{(Ans.)}$$

Here,
Velocity of sound,
$v_2 = 343.95 \text{ ms}^{-1}$
Frequency, $f = 120$ Hz

d If velocity of sound in air at 40°C temperature is v_3,

$$\frac{v_3}{v_1} = \sqrt{\frac{T_3}{T_1}}$$

$$\therefore \quad v_3 = v_1\sqrt{\frac{T_3}{T_1}}$$

$$= 332\sqrt{\frac{313}{273}}$$

$$= 355.49 \text{ ms}^{-1}$$

Here,
Velocity of sound in 0°C temperature,
$v_1 = 332 \text{ ms}^{-1}$
Temperature, $T_1 = 0°C$
$= (0 + 273)$ K
$= 273$ K
Temperature, $T_3 = 40°C$
$= (40 + 273)$ K
$= 313$ K

Now, if B hears the sound produced from A for the first time after time t_1 and then for the second time after time t_2, then he will hear the echo after time $t_2 - t_1$. Sound will travel $2 \times$ BR distance (BR = 23 – 5 = 18 m) in time $t_2 - t_1$.

$$\therefore \quad t_2 - t_1 = \frac{2 \times BR}{V_3}$$

$$= \frac{2 \times 18}{355.49}$$

$$= 0.1013$$

Which is more than 0.1s persistence of hearing. So, person B will hear the echo.

Chapter-8
Reflection of Light

Ques. ▶1 In a spherical mirror the linear magnification of an extended object is greater than 1. The focal length of the mirror is 10 cm. An object is placed at a distance 15 cm away in front of the mirror. *[M.B.-20 ❙ Ques. No.-6]*

a. What is called optical center? 1
b. Why is convex lens called converging lens? 2
c. Find out the image distance of the object of the stem. 3
d. If an extended object is placed at a distance 5cm away from the mirror, what will be the position, size and nature of the image? Analyze it with the help of ray diagram. 4

Answer to the question no. 1

a Optical centre is a fixed point placed on the main axis of a lens through which if a ray passes then incidence rays occur parallel while coming out of the other surface of the lens after refraction.

b A convex lens is also called a converging lens because it makes parallel light rays passing through it bend inward and meet (converge) at a spot just beyond the lens known as the focal point. A convex lens makes parallel light rays converge (come together) at the focal point or focus.

c As the linear magnification of an extanded object is greater than 1 the mirror is concave mirror.

Given, Focal length, f = 10cm

object distance, u = 15cm

Image distance, V =?

We know,

$$\frac{1}{v} + \frac{1}{v} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$\Rightarrow \frac{1}{v} = \frac{1}{10} - \frac{1}{15}$

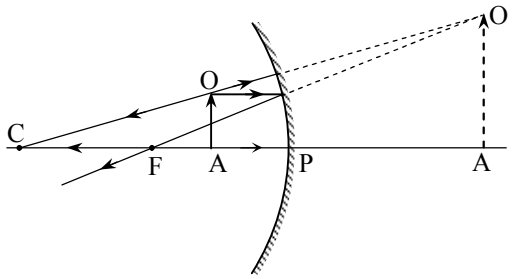
$\Rightarrow \frac{1}{v} = \frac{3-2}{30}$

$\Rightarrow \frac{1}{v} = \frac{1}{30}$

$\therefore$ v = 30cm

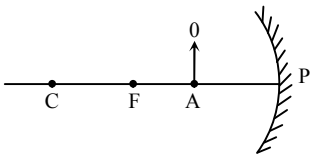
$\therefore$ Image distance of the object is 30cm **(Ans.)**

d In the given concave mirror focal length is 10 cm. The object is placed 5 cm in front of the pole and situated between pole and principal focus.



Let the object OA be placed 5 cm in front of the mirror. A ray coming from O parallel to the principal axis after reflection passes through principle focus F and another ray towards radius after reflection returns in the same path. Reflected rays appear to diverge from O′. Therefore O′ is the virtual image of O. O′A′ is the virtual image of OA. From the diagram we get,
The position of image: behind the mirror
Nature of image: Virtual and erected
Size of the image: magnified.

Ques. ▶2



In the above figure the radius of curvature of the mirror is 10 m. A is the midpoint of PF and its linear magnification of the image is "-2". *[R.B.-20 ❙Ques. No.-5]*

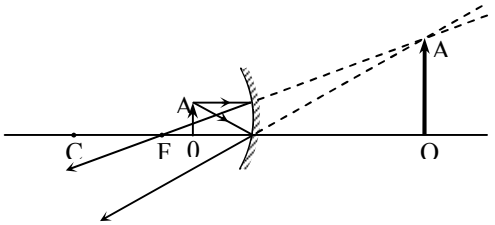
a. What is called refraction of light? 1
b. Without touching how you can detect a lens? Explain. 2
c. Determine the position of the image mathematically. 3
d. According to the stem give a brief discussion of the formation of image with ray diagram. 4

Answer to the question no. 2

a The change in direction of a wave passing from one medium to another caused by its change in speed is called refraction.

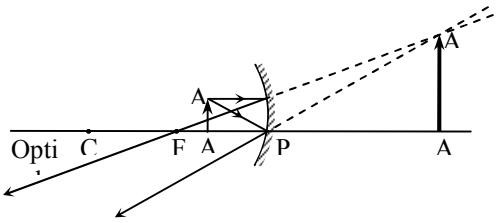
b Without touching we can detect the type of lens by studying image formed by them, In the case of a concave lens is always smaller than the object, upright, and virtual. However, the formation of the image varies with the variation of placement of the object in case of a convex lens.

c Position of the image is drawn below:



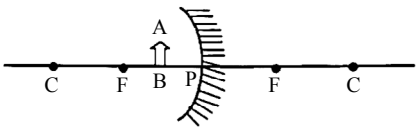
For a real object between F and the mirror, a virtual image is formed behind the mirror. The position of the image is found by tracing the reflected rays back behind the mirror to where they meet. The image is upright and larger than the object.

d According to the stem,
The radius of curvature of the mirror, PC = 10m
Therefore, focal length, $PF = \frac{10}{2} = 5m$
So, the location of the object, $AP = \frac{5}{2} = 2.5m$.



Light ray from A' strikes the concave mirror and is reflected. Another ray of light from A' strikes the mirror at the optical center and is reflected. If the extend these two reflected light rays on the opposite side of the mirror a meet at point A′. Therefore, a virtual image of A′ is formed as A″. Again the virtual image of A is formed at point A″. Therefore, we get a virtual image A″A″ of the object A′A.

Ques. ▶3



PC = 80 cm, PB = 30 cm.

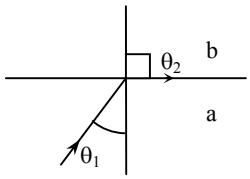
[Ctg.B.-19 ❙Ques. No.-6]

a. What is convex lens? 1
b. Why the angle of incidence of total internal reflection is greater than critical angle? 2
c. Determine the magnification of object AB. 3
d. If the object is placed 50 cm away from the optical centre then what will be the position, size and nature of the image? Explain with the help of ray diagram. 4

Answer to the question no. 3

a The lens which mid portion is thicker than the edges is called Convex Lens.

b



Let's assume, a ray of light is incident from a denser medium 'a' to another medium 'b' at an angle of θ_1 and refracted at an angle of θ_2. According to ${}_aN_b = \frac{\sin\theta_1}{\sin\theta_2}$, if θ_1 is being increased, sin θ_1 will also increase. Because of ${}_aN_b$ being constant $\sin\theta_2$ hence θ_2 will also increase and at a point θ_2 will be 90°.

The value of θ_1 at which $\theta_2 = 90°$ is called critical angle θ_c.

If incident angle is further increased, there will be no scope for light to be refracted, rather it will be reflected to the same medium and this is known as total internal reflection. Hence, in case of total internal reflection, incident angle is not greater than critical angle.

c Given that,

Focal Distance, $f = \frac{r}{2} = \frac{80}{2} = 40$ cm

Distance of Object, u = 30 cm

Distance of Image, v = ?

Magnification, |m| = ?

We know that,

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\text{or, } \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$= \frac{1}{40} - \frac{1}{30}$$

$$= -\frac{1}{120}$$

$\therefore$ v = – 120cm

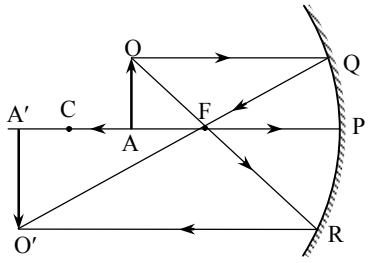
Again, $m = -\frac{v}{u}$

$$= -\frac{-120}{30} = 4 \textbf{ (Ans.)}$$

d Mirror mentioned in the stem has a center of curvature= 80 cm and focal distance= 40 cm.

$\therefore$ As placed 50 cm far from the pole of mirror, so the object is between the center of curvature and principal focus.

Let's assume an expanded object AO is placed on the principal axis PC of a concave mirror and between the center of curvature C and principal focus F. The ray emerging from O parallel to the principal axis (OQ) will go through the focal point (F) after reflection (QF) and another light ray OR going through the focus will reflect parallel to the principal axis. These two reflected rays will intersect at O'- So, O' will be the real image of O. Vertical line A'O' drawn from the O' to the principal axis will be the real image of AO. From the Figure-

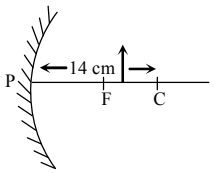


Position of Image: Between the center of curvature and infinity,

Nature of Image : Real and Inverted

Size of Image : Magnified

Ques. ▶4



Distance of object in the figure is 10cm

[All Board-18 ❙Ques. No.-5]

a. What is optical fiber? 1

b. What does the 3D power of lens mean? 2

c. Determine the distance of the image. 3

d. If the object is kept at 5cm distance in front of the mirror, then analyze by drawing the shape, nature and position of the image. 4

Answer to the question no. 4

a An optical fiber is a very thin fiber of glass used for carrying light by total internal reflection of light.

b The power of lens by 3D means that the lens is convex and it converges a group of light rays parallel to the main axis in such a way that they gather from the optical center $\frac{1}{3}$ m over the main axis.

c According to the stem, the mirror is concave.

Radius of curvature in mirror, r = 14cm

$$\therefore \text{ Focal length, } f = \frac{r}{2}$$

$$= \frac{14 \text{ cm}}{2}$$

$$= 7 \text{ cm}$$

Distance of object, u = 10 cm

$\therefore$ If the distance of mirror is v,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\text{or, } \frac{1}{v} + \frac{1}{10} = \frac{1}{7}$$

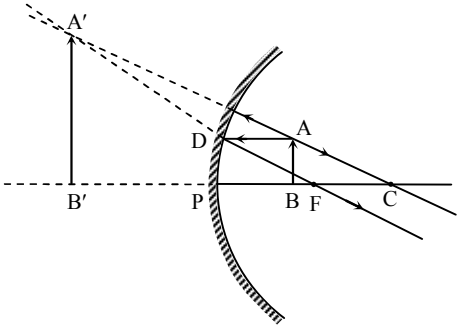
$$\text{or, } \frac{1}{v} = \frac{1}{7} - \frac{1}{10} = \frac{3}{70}$$

$\therefore$ V = 23.33 cm **(Ans.)**

d From part 'C', focal length of the mirror, f = 7 cm

If the object is kept 5 cm far, then its position will be between the pole and focus. The shape, nature and position of the image of the object at 5cm distance is

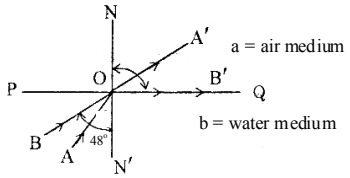
drawn and analyzed below:



Light ray occurs from A on point D parallel to the main axis. Light ray reflects from the main focus through DF path from D. Another light ray from A occurs along the center of curvature and reflects in the same path. The two reflected rays don't come together in reality. They come together at A′ point if extended backwards. So, A′ is the virtual image of A. A′B′ perpendicular is drawn from A′ over extended part PC. Therefore, A′B′ will be the image of AB.
Shape of image: Magnified
Nature of image: Virtual and upright
Position of image: Behind the mirror

Chapter-9
Refraction of Light

Ques. ▶1



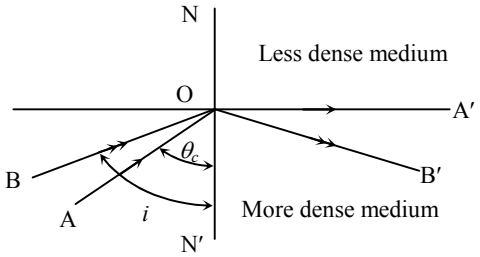
Here, $\angle BON' = 48^o$, $\angle B'ON = 90^o$ and $C_a = 3\times10^8 ms^{-1}$.
[D.B.-17 ❙ Ques. No.-6]

a. What is reflection of light? 1
b. When will total internal reflection take place? Explain. 2
c. Calculate the velocity of light in 'b' medium. 3
d. If air medium in the stem is replaced with glass medium, is it possible to find total internal reflection? Analyze drawing required figure. 4

Answer to the question no. 1

a When light rays occur on a plane of another medium while moving in one medium then some amount of light comes back to the first medium from the split of the two mediums. This event is called light reflection.

b When light rays occur in an angle larger than the critical angle of the split of the two mediums while travelling from a more dense medium to a less dense medium front then total internal reflection occurs. It is explained with ray figures below.



In the figure, while travelling from more dense medium to less dense medium, since BO ray occurs in a larger angle than the critical angle (θ_c) of the split of the two mediums so OB′ ray has returned to the previous medium, or total internal reflection occurred.

c From the stem, incidence angle, $i = \angle BON' = 48°$
Refraction angle, $r = \angle B'ON = 90°$
Light velocity in a medium, $c_a = 3 \times 10^8$ ms^{-1}
Light velocity in b medium, $c_b = ?$
We know,

$$_b\eta_a = \frac{\sin i}{\sin r} = \frac{\sin \angle BON'}{\sin \angle B'ON} = \frac{\sin 48°}{\sin 90°}$$
$$= 0.743$$

Again,

$$_b\eta_a = \frac{c_b}{c_a}$$

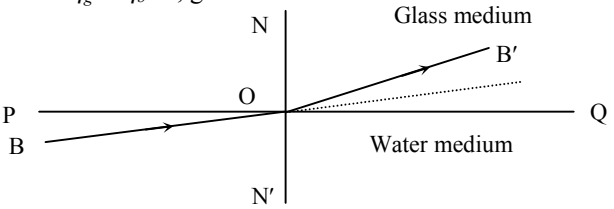
or, $c_b = c_a \times {}_b\eta_a = 3 \times 10^8 \text{ m s}^{-1} \times 0.743$
$= 2.229 \times 10^8$ ms^{-1} **(Ans.)**

d From the stem, incidence angle in b medium, $i = 48°$
Refraction angle in a medium, $r = 90°$
We know,

$$_b\eta_a = \frac{\sin i}{\sin r} = \frac{\sin 48°}{\sin 90°} = \sin 48°$$

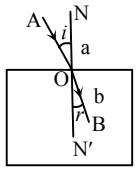
$$\therefore {}_a\eta_b = \eta_b = \frac{1}{\sin 48°} = 1.3456$$

Refractive index of glass, $\eta_g = 1.5$
Since $\eta_g > \eta_b$ so, glass is denser than water.



We know, while travelling from a less dense medium to a more dense medium, light ray moves near to the normal after refraction or refraction angle becomes smaller than the incidence angle. In the figure, split of glass and water is PQ. BO light ray has occurred on point O of the split from water. Here incidence angle, $i = \angle BON'$ and refraction angle, $r = \angle B'ON$ ($r < i$). No matter how much the incidence angle is increased (Up to 90°) refraction angle will be smaller than 90°.
So we can say that, in the figure, if it is glass medium instead of water medium then total internal reflection will never occur in it.

Ques. ▶2



[R.B.-17 ❙Ques. No.-5]

The velocity of light decreased by one-third as light entered into the medium b from medium a. Velocity of light in medium a is $3 \times 10^8 ms^{-1}$.

a. What is called refractive index? 1
b. Explain the advantage of having two eyes. 2
c. Find out the value of incident angle if the angle of refraction is 35°. 3
d. If the angle of refraction is increased by 5° without changing the value of incident angle, what will be the change of the velocity of light in medium b? Give opinion with mathematical logic. 4

Answer to the question no. 2

a If light rays of a specific colour and of a pair of specific medium refract from one medium to another medium then the ratio of sin of the incidence angle and the sin of the refraction angle is called the refractive index of the second medium with respect to the first medium for that colour.

b We see only one object when we look at an object with two eyes. Even though each of the eyes creates reflection in their own retina, but the brain combines two different reflections to one reflection. Distance can be accurately measured because of two eyes. Besides, compared to the object for different positions of the two eyes, the right eye sees the right side more and the left sees the left side more. By looking with two eyes, the superimposition of two different reflection occurs and an object can be clearly seen.

c Given that, light velocity in medium a, $c_a = 3 \times 10^8$ m s^{-1}

$\therefore$ Light velocity in medium b, $c_b = c_a - \frac{1}{3} c_a$

$$= 3 \times 10^8 \text{ m s}^{-1} - \frac{3 \times 10^8}{3} \text{ m s}^{-1}$$

$$= 2 \times 10^8 \text{ m s}^{-1}$$

Refraction angle, $r = 35°$

We know,

$$_a\eta_b = \frac{c_a}{c_b} = \frac{3 \times 10^8 \text{ m s}^{-1}}{2 \times 10^8 \text{ m s}^{-1}}$$

$$= 1.5$$

Again,

$$_a\eta_b = \frac{\sin i}{\sin r}$$

or, $\sin i = {}_a\eta_b \times \sin r$

or, $\sin i = 1.5 \times \sin 35°$

or, $\sin i = 0.86$

$\therefore$ $i = \sin^{-1}(0.86) = 59.31°$ **(Ans.)**

d From the 'c' part, incidence angle, $i = 59.31°$

Light velocity in medium b, $c_b = 2 \times 10^8$ m s^{-1}

Light velocity in medium a, $c_a = 3 \times 10^8$ m s^{-1}

Changed refraction angle, $r = 35° + 5° = 40°$

If the changed refractive index is $_a\eta'_b$,

$$_a\eta'_b = \frac{\sin i}{\sin r} = \frac{\sin 59.31°}{\sin 40°}$$

$$= 1.3378$$

Now, if the changed light velocity in medium b is c_b,

$$_a\eta'_b = \frac{c_a}{c_b'}$$

or, $c_b' = \frac{c_a}{1.3378}$

$$= \frac{3 \times 10^8 \text{ m s}^{-1}}{1.3378}$$

$$= 2.24 \times 10^8 \text{ ms}^{-1}$$

$\therefore$ Change of light velocity in medium b,

$\Delta c_b = (2.24 \times 10^8 \text{ ms}^{-1} - 2 \times 10^8 \text{ ms}^{-1}) = 2.4 \times 10^7$ ms^{-1}

Therefore, if refraction angle is increased by 5° without increasing incidence angle, then the light velocity in medium b should be increased by 2.4×10^7 ms^{-1}.

Ques. ▶3 A body is placed on the principal axis at a distance 20 cm of a lens of power +2.5d.

[C.B.-17 ❙Ques. No.-6]

a. What is called radioactivity? 1
b. A normal eye can see an object of any distance − Explain. 2
c. Determine the distance of the image of the object. 3
d. Which defect can be rectified with the help of the given lens? Explain with ray diagram. 4

Answer to the question no. 3

a The phenomenon of spontaneous emission of radioactive rays or particles from an element is called radioactivity.

b A special quality of eye lens is that it can change its shape as it wills and so focal length can change too. Because of change in focal length any object of any distance creates a clear image on a normal eye's retina. And that is why normal eye can see any object regardless its distance.

c Given that,

Lens power, $P = +2.5$ D

So, Focal length, $f = \frac{1}{P} = \frac{1}{2.5 \text{ D}} = 0.4 \text{ m} = 40 \text{ cm}$

Object's distance, $u = 20$ cm

Image's distance, $v = ?$

We know,

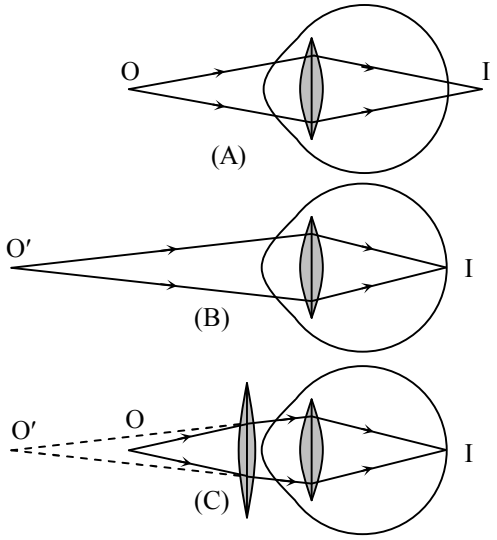
$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

or, $\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{40 \text{ cm}} - \frac{1}{20 \text{ cm}} = \frac{1-2}{40 \text{ cm}} = \frac{-1}{40 \text{ cm}}$

$\therefore$ $v = -40$ cm

So, image will be at the same side of object and 40 cm away from lens. **(Ans.)**

d The lens described in stem is a convex lens. This lens is used for hypermetropia. Below use of such lenses for the remedy of hypermetropia is shown with diagrams.



Hypermetropia causes images to be created at I, the backside of retina, for rays that comes from a nearer point O (Diagram - A) so eye cannot see the point. But rays coming from nearest point O′ creates an image on retina (Diagram - B) so eye can see it. So, now if the rays coming from O are made so that it seems to come from O′ with the use of a convex lens than eye can see that object at O′.

Ques. ▶4

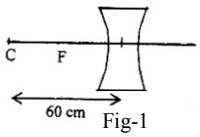


Fig-1

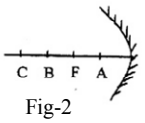


Fig-2

[Ctg.B.-17 ❙ Ques. No.-5]

a. What is called optical center of a lens? 1

b. Explain the accommodation of eye. 2

c. Find the power of lens in figure 1. 3

d. How will be the image if the object is kept at A and B in figure 2? Analyze with ray diagram. 4

Answer to the question no. 4

a The point on the principal axis inside a lens through which if a ray of light is passed then due to refraction if the ray emerges from the other surface being parallel to the incident ray then it is called optical center.

b The power of eye to adjust its focal length to see objects of any distance is known as accommodation of eye. Because of this power shape of eye lens changes as it deems necessary, so focal length changes too. And because of this change for any distance the image created in our retina stays at the same point and we can see the object.

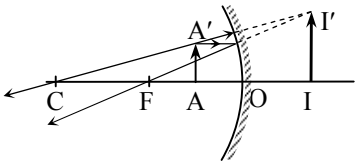
c The lens of diagram – 1 is a concave lens.

According to diagram, lens' focal length, $f = \frac{-60\text{ cm}}{2} =$ – 30 cm = – 0.3m

So, power of lens,

$$P = \frac{1}{f} = \frac{1}{-0.3}\text{ D} = -3.33\text{ D}$$ **(Ans.)**

d The mirror of 2nd diagram is a convex mirror. Mirror's principal focus is F, center of curvature is C and pole is O. Between O and F there is an object AA′. A ray from A′ that is parallel to principal axis after reflection goes through principle focus F and ray that goes through center of curvature C comes back the same route after reflection. Reflected rays seem to be coming from point I′. So, I′ is virtual image of A′. Vertical line drawn from I′ on OC which is II′ is virtual image of AA.

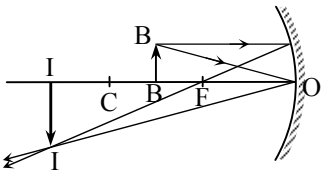


Position of Image : Behind the mirror

Nature : Virtual and Straight

Shape : Magnified

F and C has an object BB′ between them. A ray from B′ that is parallel to principal axis after reflection goes through principal focus F and another ray that goes through center of curvature C comes back the same way. Reflected rays meet at I′. A vertical line drawn from I′ on OC is II′ which is image of object BB′.



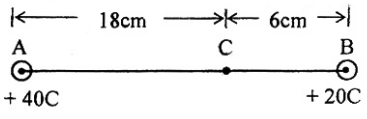
Position of Image : Far from the centre of curvature but not at infinite.

Nature : Real and Inverted

Shape: Magnified

Chapter-10
Static Electricity

Ques. ▶1



[D.B.-17 ❙Ques. No.-3]

Charges A and B are placed in air medium.

a. What is electric potential? 1

b. 220V−60W is written in an electric bulb. Explain the meaning. 2

c. Find out the amount of force acting between the charges A and B. 3

d. If a unit positive charge is placed at the point C, for which charge the intensity at C will be greater? Explain mathematically. 4

Answer to the question no. 1

a The work done to bring a unit positive charge from an infinite distance to any point of the electric field is called the electrical potential of that point.

b The meaning of 220 V – 60 W on the surface of a bulb is, if the bulb is attached with 220 V potential difference then the bulb power will be 60 W or it will spend electric energy at a 60 joule per second rate.

c From the stem,

Charge placed on point A, $q_1 = +40$ C

Charge placed on point B, $q_2 = +20$ C

Distance between A and B, $d = 18$ cm + 6 cm $= 24$ cm $= 0.24$ m

Coulomb constant, $C = 9 \times 10^9$ N m^2 C^{-2}

Value of the force acting between the two charges, $F = ?$

We know,

$$F = C\frac{q_1 q_2}{d^2} = 9 \times 10^9 \times \frac{40 \times 20}{(0.24)^2}$$

$$= 1.25 \times 10^{14} \text{ N } \textbf{(Ans.)}$$

d Given that, charge placed on point A, $q_1 = +40$ C

Charge placed on point B, $q_2 = +20$ C

Charge placed on point C, $q = +1$ C

Distance between A and C, $d_1 = 18$ cm $= 0.18$ m

Distance between B and C, $d_2 = 6$ cm $= 0.06$ m

Coulomb constant, $C = 9 \times 10^9$ N m^2 C^{-2}

Intensity at point C for the charge placed on point A,

$$E_1 = C\frac{q_1}{d_1^2} = 9 \times 10^9 \times \frac{40}{(0.18)^2}$$

$$= 1.11 \times 10^{13} \text{ NC}^{-1}$$

Again, intensity at point C for the charge placed on point B,

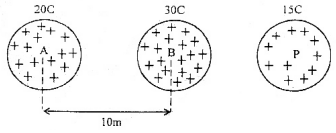
$$E_2 = C\frac{q_2}{d_2^2} = 9 \times 10^9 \times \frac{20}{(0.06)^2}$$

$$= 5 \times 10^{13} \text{ NC}^{-1}$$

From the result, $E_2 > E_1$

Therefore, intensity at point C for the charge placed on point B is more.

Ques. ▶2



[R.B.-17 ❙Ques. No.-4]

a. What is called P−n junction? 1

b. Explain how we can perceive the colour of coloured object. 2

c. Find out the force between the charges A and B. 3
[Here constant C = 9×10^9Nm^{2}C^{-2}]

d. At what position between the charges A and B is the charge P placed so that there is no effect of charges A and B on charge P? 4
Give your opinion through mathematical analysis.

Answer to the question no. 2

a Junction created from the combination of a p-type semiconductor and an n-type semiconductor is called p-n junction diode.

b When we see an object, light from the object refracts on the eye lens and creates a reflection of the retina. The nerves that go from the retina all the way to the brain are called rod and cone. Some of this nerves are colour-sensitive. There are three kinds of cones: blue colour-sensitive cone, red colour-sensitive cone and green colour-sensitive cone. No matter how much complex a colour is, the eyes retain every colour in these three colours. The cones of the retina emit this retained information to the brain. Again the brain separates each colour by a special process. This is how we perceive the colour of a colourful object.

c Given that, charge of object A, $q_1 = 20$ C

Charge of object B, $q_2 = 30$ C

Coulomb constant, $C = 9 \times 10^9$ N m^2 C^{-2}

Distance between A and B, $d = 10$ m

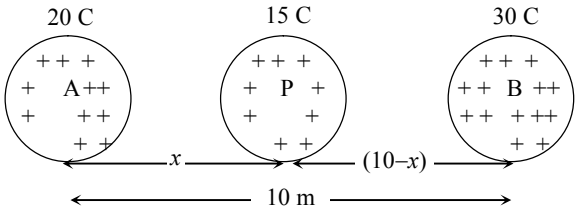
Force between the two charges, $F = ?$

We know from the law of coulomb,

$$F = C\frac{q_1 q_2}{d^2} = 9 \times 10^9 \text{ N m}^2 \text{ C}^{-2} \times \frac{20 \text{ C} \times 30 \text{ C}}{(10 \text{ m})^2}$$

$$= 5.4 \times 10^{10} \text{ N } \textbf{(Ans.)}$$

d Let, if P charge is placed at x distance from A then it is not affected by the two charges A and B. It is shown in the figure below.



Force of A on P, $F_{AP} = C\dfrac{q_A \times q_P}{x^2}$

Force of B on P, $F_{BP} = C\dfrac{q_B \times q_P}{(10-x)^2}$

Since P is not affected by A and B charges,

$$F_{AP} = F_{BP}$$

$$\text{or, } C\frac{q_A \times q_P}{x^2} = C\frac{q_B \times q_P}{(10-x)^2}$$

$$\text{or, } \left(\frac{10-x}{x}\right)^2 = \frac{q_B}{q_A} = \frac{30\text{ C}}{20\text{ C}} = 1.5$$

$$\text{or, } \frac{10-x}{x} = 1.225$$

$$\text{or, } 10 - x = 1.225x$$

$$\text{or, } x + 1.225x = 10$$

$$\text{or, } x(1 + 1.225) = 10$$

$$\text{or, } x = \frac{10}{2.225}$$

$$\therefore\ x = 4.49\text{ m}$$

Therefore, if charge P is placed 4.49m away from charge A then it won't be affected by A and B charges.

Ques. ▶3 A and B are two charged body and C is a neutral body. The charge of A and B are −5C and +10C respectively. The electric intensity of a point 'X' is 2 NC^{-1} for B which is nearer to A. *[Dj.B.-17 ❙ Ques. No.-6]*

a. What is electric energy? 1

b. Within resistance and resistivity which term is dependent on the physical state? 2

c. Find the force on point 'X' applied by B. 3

d. Is it possible to convert object C into a negatively charged object by the object A and B due to induction? Explain with logic. 4

Answer to the question no. 3

a If the potential difference is applied on the two ends of a conductor then electric flow occurs in that conductor. As a result, the energy that the electrons gain is called electric energy.

b The resistance of a conductor in a fixed temperature depends on its physical state (for example length, cross-section). But its resistivity depends only on its material. So, we can say that, between resistance and resistivity, resistance depends on the physical state of matter.

c From the stem,

Electric intensity at 'X' point, $E = 2\ NC^{-1}$

Charge placed on B point, $q_B = +10$ C

Force felt by B at 'X' point, $F_B = ?$

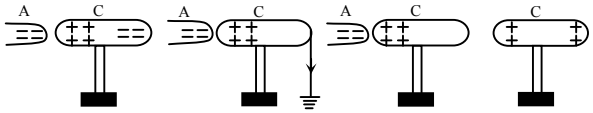
We know,

$$E = \frac{F_B}{q_B}$$

or, $F_B = E \times q_B$

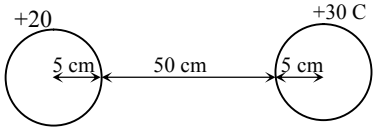
$= 2\text{ N C}^{-1} \times 10\text{ C} = 20\text{ N}$ **(Ans.)**

d Object C can be charged in positive charge by object A through electric induction process. In this process, object A is held near to the object C at first.



This way free electrons in object C move to opposite ends from the repulsion of the electrons in object A. Now, without moving object A if object C is touched by hand or connected to an earthing system then the free electrons move to the Earth surface. Now, if the earthing system is disconnected then the positive charges stay still in one end of object C. Now if the object A is moved away then the positive charges spread all around in the object C. As a result, object C will be charged in positive charge.

Ques. ▶4



[Ctg.B.-17 ❙ Ques. No.-7]

a. What is called electric intensity? 1

b. Write down two differences between α and γ ray. 2

c. What is the repulsion force between the charges? 3

d. What will be the change in force if the charge is connected by an wire? Analyze mathematically. 4

Answer to the question no. 4

a If at any point of an electric field a unit of positive charge is placed and the force that it acquires is called the electric intensity at that point.

b Difference between alpha and gamma ray:

Alpha Ray	Gamma Ray
1. Alpha ray is positively charged particle.	1. Gamma ray is charge neutral electromagnetic wave.
2. Its mass is four times of hydrogen atom's mass.	2. It has no mass.

c Given that,

First sphere's charge, $q_1 = +20$ C

Another sphere's charge, $q_2 = +30$ C

Distance between their center, $d = (5 + 50 + 5)$ cm

$= 60$ cm

$= 0.6$ m

Repulsive force between charges, $F = ?$

We know,

$$F = C\frac{q_1 q_2}{d^2} = 9 \times 10^9 \text{ N m}^2 \text{ C}^{-2} \times \frac{20 \text{ C} \times 30 \text{ C}}{(0.6 \text{ m})^2}$$

$= 1.5 \times 10^{13}$ N **(Ans.)**

d As both charges have same shape so if they are connected charge will flow from + 30 C sphere to + 20 C sphere till both sphere shares the same amount of charge.

Total charge = + 30 C + 20 C = + 50 C

So, each sphere will have, $q = +25$ C charge.

Distance, $d = 0.6$ m

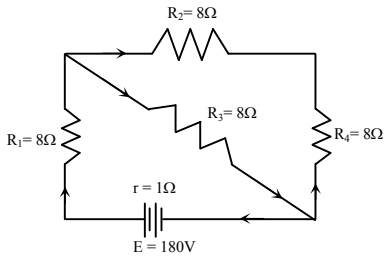
Repulsive force, $F' = C\frac{q_1 q_2}{d^2} = 9\times10^9 \times \frac{25 \text{ C} \times 25 \text{ C}}{(0.6 \text{ m})^2}$

$= 1.56 \times 10^{13}$ N

Which is more than previous charge ($F = 1.5 \times 10^{13}$ N) means if these spheres are connected their repulsive force will be more than before.

Chapter -11
Current Electricity

Ques. ▶1



[D.B.-20 ❙Ques. No.-7]

a. Write down Ohm's law. 1

b. Why generator is called the opposite device of motor? 2

c. Determine the lost voltage of the circuit. 3

d. Whether the power is equal or not when the magnitude of three resistance R_1, R_2 and R_3 are equal. Analyze mathematically. 4

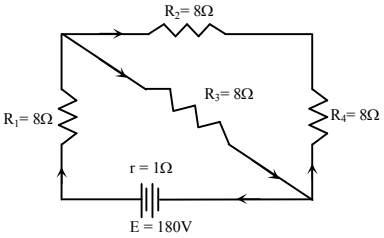
Answer to the question no. 1

a The current passing through a wire at a constant temperature is proportional to the potential difference between its two ends. Symbolically, $\frac{V}{I} = R$.

(V ⇒ Potential difference, I ⇒ Current, R ⇒ resistance)

b Even though the structure of a motor and a generator is the same, since their type of work is different so a generator is also called the opposite machine of a motor. Generator changes mechanical energy to electric energy. On the other hand, Motor changes electric energy to mechanical energy. Again, the generator is made basing on the law of electromagnetic induction. On the other hand, motor is made by using the effect of the magnetic field on a conducting wire.

c To determine the lost voltage we need to find the total current flow through the bettary.



Here, R_2 and R_4 are in series connection the equivalent resistance the, $R_{24} = R_2 + R_4$

$= (8 + 8)$

$= 16\Omega$

R_{24} and R_3 are in parallel connection, het the equivalent resistance the $R_3' = \frac{1}{\frac{1}{R_3} + \frac{1}{R_{24}}}$

$$= \frac{16 \times 8}{16 + 8} = \frac{16}{3}\Omega$$

Now, R_1 and R_3' are in series connection, het, the equiralent resistance be, $R1'$

$R_1' = R_1 + R_3'$

$= \frac{16}{3} + 8 = \frac{40}{3}\Omega$

Now, adding the internal reistance 1Ω with the equivalent esistance R_1', we will get the total equivalent resistance

$R_{eq} = R_1' + r$

$= \frac{40}{3} + 1$

$= \frac{43}{3}\Omega$

The current flow of the circuit is

$1 = \frac{V}{R}$

$= \frac{180}{\frac{43}{3}}$

$= 12.558A$

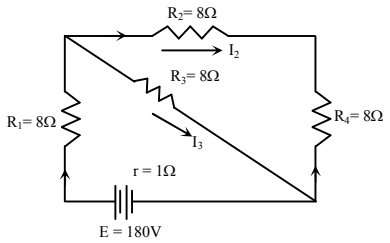
Therefore, the lost voltage of the circuit,

$V_2 = I \times r$

$= 12.558 \times 1$

$= 12.558V$ **(Ans.)**

d



The resistance of R_1, R_2 and R_3 are equal. But the power consumption of them can be different.

At first, for R_1,

$P_1 = I_1^2 R_1$

From 'C', we get the current flow, J = 12.558 A.

there, 'I' flows through R_1, So, $I_1 = I$.

$\therefore P_1 = (12.558)^2 \times 8$

$= 1261.63W$

Current will divide in too branches after passing R_1

But the voltage difference of the two terminal is some therefore

$I_2 (R_2 + R_4) = I_3 \times R_3$

or, $16I_2 = 8I_3$

or, $2I_2 = I_3$

Again, $I_1 = I_2 + I_3$

or, $12.558 = I_2 + 2I_2$

$\therefore 3I_2 = 12.558A$

$I_2 = 4.186A$

and, $I_3 = 2I_2$

$= 2 \times 4.186$

$= 8.372A$

The power across R_2 is,

$P_2 = I_2^2 R_2$

$= (4.186)^2 \times 8$

$= 140.18W$

The power across R_3 is,

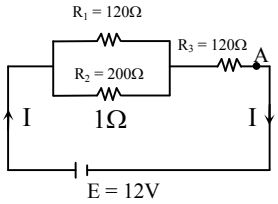
$P_3 = I_3^2 R_3$

$= (8.372)^2 \times 8$

$= 560.72W$

Therefore, the power is not equal though the magnitiude of the resistances are equal. Because the amount of current flow is different.

Ques. ▶2



[C.B.-20 ❙Ques. No.-6]

a. What is radioactivity? 1

b. The images formed by the CT scan and X-Ray are not same— Explain. 2

c. Calculate the current at point 'A' of the given circuit. 3

d. By disconnecting which resistance, the electric current of the circuit will be maximum? Give opinion with mathematical analysis. 4

Answer to the question no. 2

a The property possessed by some elements (such as uranium) or isotopes (such as carbon 14) of spontaneously emitting energetic particles (such as electrons or alpha particles) by the disintegration of their atomic nuclei.

b Minor though the significant difference between X-ray and CT scan is that, X-ray is used to detect the fractures and dislocation of bones, it can also detect pneumonia, cancers. On the other hand, CT scan is a kind of advanced X-ray machine used to diagnose the delicate internal organs, injuries carefully, it uses both various X-ray images of the structure, along with the computer and provides the result.Secondly, X-ray machines sometimes fail in diagnosing soft tissues, muscles damage and other body organs, which is possible through Computed Tomography procedure commonly known as CT scan. Images produced by X-ray are in 2D, whereas 3D images are formed in CT scan.

c R_1 & R_2 are is parallel

So, $R_P^{-1} = \frac{1}{R_1} + \frac{1}{R_2}$

$R_P^{-1} = \frac{1}{120} + \frac{1}{200}$

$R_P = 75\Omega$

Total resistance $R_P + R_3$

$= 295\Omega$

Current at A, $I_A = \frac{V}{R}$

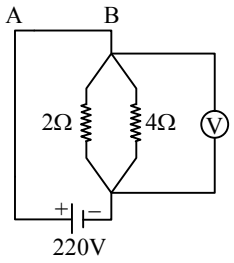
$= \frac{12}{295}$

$= 0.0407$ A

d We know, where resistances greter than 1Ω are connected is parallel, the equivalent resistance R_P becomes less than each of those resistances. So, if we disconnect the R_3 reoistance the resultant resistance will be minimum and current of the circuit will be maximum.

If we disconnect R_3,
$R_p = 95\Omega$
$I = \frac{12}{95} = 0.126A$
Other may of testing,
Disconnect R_2 $R = R_1 + R_3$
$= 120 + 220$
$= 340\Omega$
Disconnect R_1, $R = R_2 + R_3$
$= 200 + 220$
$= 420\Omega$
In each of the cases, resistance is greater.

Ques. ▶3



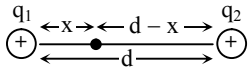
[R.B.-19 ❙Ques. No.-8]

a. What is radioactivity? 1
b. Explain why the neutral point of two unequal positive charges is nearer to smaller one. 2
c. Find out the electric current of given circuit. . 3
d. If a resistance of 10Ω is connected between A and B, what will be the change of potential difference? Analyze it with logic. 4

Answer to the question no. 3

a The spontaneous event of the emission of radioactive particles or rays from an element is called radioactivity.

b



Let, q_1 and q_2 be two positive charged bodies kept at d distance where,
$q_1 < q_2$
Now, if there is a neutral point at x distance from q_1 then the electric intensity from both charges at that point will be equal.

$\therefore E_1 = E_2$
or, $k\frac{q_1}{x^2} = k\frac{q_2}{(d-x)^2}$
or, $\frac{q_1}{x^2} = \frac{q_2}{(d-x)^2}$
or, $\frac{x^2}{(d-x)^2} = \frac{q_1}{q_2} < 1 \quad [\because q_1 < q_2]$
or, $\frac{x^2}{(d-x)^2} < 1$
or, $x^2 < (d-x)^2$
$\therefore x < d - x$

$\therefore$ the neutral point will be much closer to q_1 which is smaller between the two charges.

c If R_p is the equivalent resistance of $R_1 = 2\Omega$ and $R_2 = 4\Omega$ resistances connected in parallel circuit,

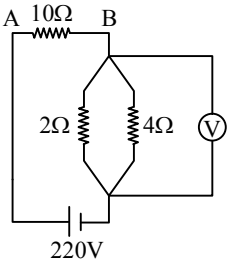
$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$$
or, $\frac{1}{R_P} = \frac{R_2 + R_1}{R_1 R_2}$
or, $R_P = \frac{R_1 R_2}{R_1 + R_2}$
$\therefore R_P = \frac{2 \times 4}{2 + 4} = \frac{4}{3}\Omega$

$\therefore$ If flow of current in the circuit is I,

$I = \frac{V}{R_P}$
$= \frac{220}{\frac{4}{3}}$
$= 165$ A **(Ans.)**

Here,
Electromotive force,
V = 220V

d In the figure, the potential difference in the parallel circuit will be equal to the electromotive force which is $V_1 = 220V$
Now, if 10Ω resistance is connected between A and B then the circuit will be–



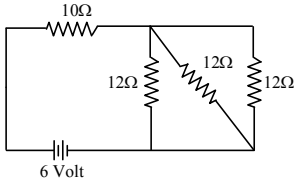
Now if the potential difference in parallel connection is V_2,

$V_2 = \frac{R_P}{R_P + R_3} V$
$= \frac{\frac{4}{3}}{\frac{4}{3} + 10} \times 220$
$= 25.88$ V

Here,
Equivalent resistance of parallel connection from 'c',
$R_P = \frac{4}{3}\Omega$
Resistance between A and B,
$R_3 = 10\Omega$
Electromotive force, V = 220V

So, potential difference will decrease from 220V to 25.88V.
Therefore, if 10Ω resistance is connected between A and B then the potential difference will decrease by 220 – 25.88 = 194.12V.

Ques. ▶4



[Dj.B.-19 ❙Ques. No.-6]

a. What is resistance? 1
b. What is the reason for low resistance use in earth connecting wire? Explain. 2
c. Determine the equivalent resistance of the circuit that mention in the stem. 3
d. How to arrange the resistances of the circuit to get almost 3.14 W electric power? Show with mathematical analysis. 4

Answer to the question no. 4

a Resistance is the obstacle to the flow of current in a conductor.

b Electrical charge accumulates in the metal parts of different electrical machines for different reasons. The metal parts of the machines are connected to the ground so that the accumulated charges can easily go to the ground, this prevents any accident when someone touches the metal parts. In case of ideal ground connection, the resistance of the connecting wire should be zero, otherwise the machines will be in a certain potential difference from the ground, which can electrocute anyone touching the machines. But in reality, a wire with zero resistance doesn't exist. This is why wires with really low resistance are used in this case.

c If R_p is the equivalent resistance of 3 12Ω-resistances connected in parallel circuit, $\frac{1}{R_p} = \frac{1}{12} + \frac{1}{12} + \frac{1}{12} = \frac{3}{12}$

$\therefore R_p = \frac{12}{3} = 4\Omega$

Again, if R_s is the equivalent resistance of 10Ω resistance connected in series connection with the parallel connection,

$R_s = 10 + R_p$
$= 10 + 4$
$= 14\Omega$ **(Ans.)**

d In the circuit, if power is P = 3.14 W and the equivalent resistance is R,

$P = \frac{V^2}{R}$

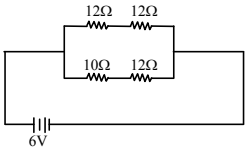
or, $R = \frac{V^2}{P}$

$= \frac{6^2}{3.14}$

$= 11.46\ \Omega$

Here,
Electromotive force, V = 6V

The equivalent resistance will be 11.47Ω if the resistances of the circuit is arranged in the following way.



If R_{s_1} is the equivalent resistance of two 12Ω resistances,

$R_{s_1} = 12 + 12 = 24\Omega$

If R_{s_2} is the equivalent resistance of 12Ω and 10Ω resistance,

$R_{s_2} = 12 + 10 = 22\Omega$

If R' is the equivalent resistance of Rs_1 and Rs_2 connected in parallel,

$\frac{1}{R'} = \frac{1}{R_{s_1}} + \frac{1}{R_{s_2}} = \frac{1}{24} + \frac{1}{22} = \frac{23}{264}$

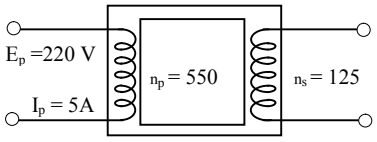
$R' = \frac{264}{23} = 11.47\Omega$

$\therefore R' = R$

So, if the circuit is arranged in the mentioned way then the power acquired will be almost 3.14 W.

Chapter-12
Magnetic Effects of Current

Ques. ▶1



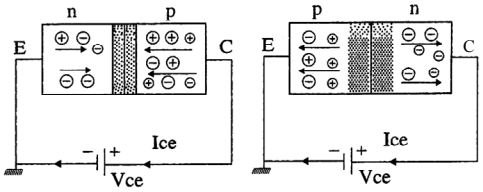
[All Board-18 ❙ Ques. No.-3]

a. What is electromagnetic induction? 1
b. Explain that p-n junction works as a rectifier. 2
c. Determine the voltage of the secondary coil. 3
d. According to the stem, mathematically show that, the total power of the primary coil is equal to the total power of the secondary coil. 4

Answer to the question no. 1

a During the time of changing the magnetic field in a coil of wire, the generation of voltage and current in the coil is called electromagnetic induction.

b A p-n junction diode is made by connecting a p-type semiconductor and a n-type semiconductor.



Forward Bias Reverse Bias

Current flows through p-n junction when an external voltage of potential difference is applied to it. Voltage is applied in such a way that the positive end of battery or cell is connected to p-type object and negative end is connected to n-type object so the application of forward bias in the diode will let the positive end of battery pull the electrons towards p-type object and the negative end of battery will pull the holes towards n-type object. As a result, current will flow through p-n junction and external loop. If voltage is applied in the reverse bias, free electrons in n-type object will stay in n-type object because of the attraction of the negative end of battery, they won't be able to go to p-type object through p-n junction. The holes in p-type object will also remain there. So, current won't flow through the junction. From the above event, when voltage is applied, p-n junction permits the flow of electron in only one direction. So, it works as a rectifier.

c Here, voltage of primary coil, $E_p = 220$ V
Number of turns in primary coil, $n_p = 550$
Number of turns in secondary coil, $n_s = 125$
If the voltage of secondary coil is E_s,

$$\frac{E_p}{E_s} = \frac{n_p}{n_s}$$

$$\therefore E_s = \frac{n_s}{n_p} \times E_p$$

$$= \left(\frac{125}{550} \times 220\right) \text{V}$$

$$= 50 \text{ V}$$ **(Ans.)**

d Here, voltage of primary coil, $E_p = 220$ V
Current flowing through primary coil, $I_p = 5$A
From part 'C', voltage of secondary coil, $E_s = 50$ V
If the current flow in secondary coil is I_s,

$$\frac{E_p}{E_s} = \frac{I_s}{I_p}$$

$$\therefore I_s = \frac{E_p}{E_s} \times I_p$$

$$= \left(\frac{220}{50} \times 5\right) \text{A}$$

$$= 22\text{A}$$

$\therefore$ Total power in primary coil, $P_p = E_p I_p$
$= (220 \times 5)$ W
$= 1100$ W

Total power in secondary coil, $P_s = E_s I_s$
$= (50 \times 22)$ W
$= 1100$ W

So, $P_p = P_s$
Therefore, the total power of the primary coil is equal to the total power of the secondary coil. (Showed).

Ques. ▶2 The ratio of the number of turns of the primary and secondary coil of a transformer is 1 : 50. The electric current and voltage of the primary coil is 5A and 220V respectively. *[D.B.-17 ❙Ques. No.-8]*

a. What is solenoid? 1
b. Why motor is called the opposite instrument of generator? 2
c. Find $E_p : E_s$ according to the stem. 3
d. From the stem mathematically show that the electric power of the primary and secondary coil of the transformer remains constant. 4

Answer to the question no. 2

a Solenoid is a cylindrical coil of wire which creates magnetic field like a bar magnet when electricity flows in it.

b Even though the structure of a motor and a generator is same, since their type of work is different so a motor is also called the opposite machine of a generator. Motor changes electric energy to mechanical energy. On the other hand, generator changes mechanical energy to electric energy. Again, motor is made by using the effect of magnetic field on a conducting wire. On the other hand, generator is made basing on the law of electromagnetic induction.

c From the stem,
Ratio of the number of turns of the primary and secondary coil, $\frac{n_P}{n_S} = \frac{1}{50}$

We know,

$$\frac{E_P}{E_S} = \frac{N_P}{N_S} = \frac{1}{50}$$

$\therefore E_P : E_S = 1 : 50$ **(Ans.)**

d From the stem,
Flow of primary coil, $I_P = 5$ A
Voltage of primary coil, $E_P = 220$ V
Ratio of the number of turns of the primary and secondary coil, $\frac{n_P}{n_S} = \frac{1}{50}$
Let, voltage of secondary coil = E_S
Flow of secondary coil = I_S
We know,

$$\frac{E_P}{E_S} = \frac{n_P}{n_S} = \frac{1}{50}$$

or, $E_S = 50 \times E_P = 50 \times 220$ V $= 11000$ V
Again,

$$\frac{E_P}{E_S} = \frac{I_S}{I_P}$$

or, $I_S = \frac{E_P \times I_P}{E_S} = \frac{220 \text{ V} \times 5 \text{ A}}{11000 \text{ V}} = 0.1$ A

Now, electric power of the primary coil of the transformer,

$$P_P = E_P \times I_P = 220 \text{ V} \times 5 \text{ A} = 1100 \text{ W}$$

Power of the secondary coil, $P_S = E_S \times I_S = 11000$ V $\times$ 0.1 A $= 1100$ W
Here, $P_P = P_S$
Therefore, electric power is constant in the primary and secondary coil of the transformer.

Ques. ▶3

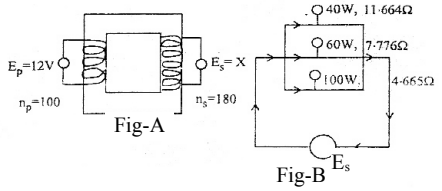


Fig-A
Fig-B

[R.B.-17 ❙Ques. No.-8]

a. Write elaboration of ECG. 1
b. Why is electric current reduced for transmission of electricity over long distances? 2
c. Find the value of X from figure : A. 3
d. If all bulbs run at a time with the obtained value of X in figure : B, is it possible to get the maximum light? Give your opinion through mathematical analysis. 4

Answer to the question no. 3

a The full form of ECG is electrocardiogram.

b In case of transmitting electricity over long distances, electric current is reduced due to energy loss from heat and system loss of electricity. The more current flows in the lines used to send electricity over long distances, the more it heats up. This heat energy spreads to the surrounding air. Electricity is used and wasted to create heat energy. Besides, the more the lines heat up, their resistances increase as well. This is why electric current is reduced for transmission of electricity over long distances.

c From the stem, voltage of primary coil, $E_P = 12$ V
No. of turns in primary coil, $n_P = 100$
No. of turns in secondary coil, $n_S = 180$
Voltage of secondary coil, $E_S = x = ?$

We know,

$$\frac{E_P}{E_S} = \frac{n_P}{n_S}$$

$$\text{or, } E_S = \frac{n_S \times E_P}{n_P} = \frac{180 \times 12 \text{ V}}{100}$$

$$= 21.6 \text{ V } \textbf{(Ans.)}$$

d From 'c' part,

Value obtained of X, $E_S = 21.6$ V

Given that, power of 1st bulb, $P_1 = 40$ W
Resistance of 1st bulb, $R_1 = 11.664\ \Omega$
Power of 2nd bulb, $P_2 = 60$ W
Resistance of 2nd bulb, $R_2 = 7.776\ \Omega$
Power of 3rd bulb, $P_3 = 100$ W
Resistance of 3rd bulb, $R_3 = 4.665\ \Omega$

Since the three bulbs are in parallel circuit, so the potential difference between two ends of each bulb will be $V = E_S = 21.6$ V.

We know,

$$P_1 = \frac{V^2}{R_1} = \frac{(21.6 \text{ V})^2}{11.664\ \Omega} = 40 \text{ W}$$

Similarly,

$$P_2 = \frac{V^2}{R_2} = \frac{(21.6 \text{ V})^2}{7.776\ \Omega} = 60 \text{ W}$$

$$P_3 = \frac{V^2}{R_3} = \frac{(21.6 \text{ V})^2}{4.665\ \Omega} = 100 \text{ W}$$

Therefore, if the bulbs of figure B are turned on together using the value obtained of X then the bulbs will turn on using their own power. So, it is possible to get the maximum amount of light from the bulbs.

Ques. ▶4

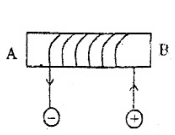


Fig-1

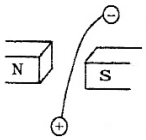


Fig-2

[C.B.-17 ▮ Ques. No.-8]

a. What is angiography? 1
b. How does a speaker work? Explain it. 2
c. Which one is north-pole in fig 1? Explain. 3
d. In which direction will the wire in fig 2 acquire resultant force? Explain it. 4

Answer to the question no. 4

a Angiography is such an imaging test where X-ray is used to view the blood vessels of the body. This test is used to study whether the arteries or veins are narrow, blocked or enlarged in the body.

b Functions of speaker: Most of the loudspeakers are moving coil loudspeaker. It has-

1. A cylindrical permanent magnet which produces a strong magnetic field.
2. A small coil or wire-loop is suspended. This wire-loop can oscillate freely in the magnetic field.
3. A paper cone remains attached with wire-loop.

When the alternating current produced by the sound flows through the loop, the loop moves to and fro. For this reason, the paper cone is vibrated. As a result, sound is produced.

c Of A and B shown in the diagram, B is north pole.
Explanation: If it is observed from B end, current flow will seem to be anti-clockwise. So, north pole will be created at the nearer point, that is B.

d In the diagram, there is a conductor wire between two magnet bars. Magnetic force lines are flowing from north to south pole. Again, in the wire current is flowing from (+) end to (–) end. Magnetic field will generate a force on this wire. And the direction of this force is downwards. Because as current flows through the wire direction of the magnetic force lines on its upper part and force lines created due to magnetic poles are same and so the density increases. On the other hand, the magnetic force lines at the lower part of the wire are in an opposite direction so density decreases.