# SOLUTIONS TO S. 4 PHYICS EXERCISE 01

1. A converging lens acts as a magnifying glass when the object is……………….
   A. at the principal focus
   B. between F and 2F
   C. beyond 2F
   **D. between the lens and F**

2. The force a body needs to move at a constant speed in circle is,
   **A. centripetal force towards the centre**
   B. centrifugal force towards the centre.
   C. centrifugal force away from the centre
   D. centripetal force away from the centre

3. An object is placed between two mirrors inclined at $\theta^0$ to each other. If N images are formed. Calculate the value of $\theta$.
   A. $360^0 + N + 1$
   **B. $\frac{360^0}{N+1}$**
   C. $\frac{N+1}{360^0}$
   D. $\frac{360^0}{N} - 1$

4. A body X moving at 6ms$^{-1}$ hits a stationary body Y of the same mass and the two move together. What is their common velocity?
   A. 1ms$^{-1}$
   B. 2ms$^{-1}$
   **C. 3ms$^{-1}$**
   D. 6ms$^{-1}$

5. The mass of a sample of radioactive iodine-131 is 800g. If the half-life of iodine -131 is 8 days, find the mass remaining undecayed after 32 days.
   A. 25g
   **B. 50g**
   C. 100g
   D. 200g

6. Mosquito larvae cling to water surfaces because
   A. it's less dense than water.
   **B. of surface tension of water**
   C. of repulsion forces from water molecules
   D. of attraction from molecules above the water surface

7. A list of electrical appliances with their voltages and ratings is shown   below:

   | Appliance | Power rating | Voltage |
   |---|---|---|
   | Car head lamp | 48W | 12V |
   | Electric drill | 260W | 250V |
   | Bedside lamp | 50W | 250V |
   | Electric iron | 1500W | 250V |

   Which appliance has the highest resistance?
   A. Electric drill
   B. car head lamp
   C. Electric iron
   **D. Bedside lamp**

8. Moment of a couple is defined as the product of
   A. the sum of clockwise moments and anticlockwise moments

B. one force and the perpendicular distance from the pivot.

C. forces and the perpendicular distance between the forces

**D. one force and the perpendicular distance between the forces.**

9.
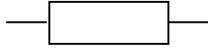


The figure above shows an electrical symbol for a

A. cell                                              **B. resistor**

C. rheostat                                      D. resistance box

10. Which of the following actions does not cause an induced e.m.f to be set up in a coil of wire?

A. withdrawing a magnet from inside the coil

B. pushing a magnet into a stationary coil

C. moving a coil over a stationary magnet

**D. a steady current flowing through the coil**

11. An elastic wire extending by 0.5cm when a load of 0.4N hangs from it. What additional load will be required to cause a further extension of 1.5cm?

**A. 0.8N**        B. 1.0N            C. 1.2N                    D. 8.0N

12. Two resistors of 3Ω and 6Ω are connected as shown in the figure below. Calculate the potential difference across the 3Ω resistor.
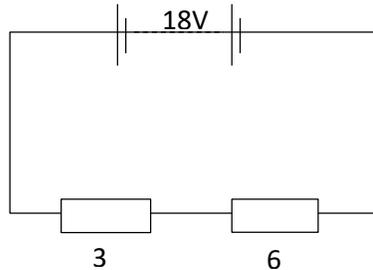


A. $\frac{9 \times 6}{18}$ $V$              B. $\frac{18 \times 6}{9}$ $V$              C. $\frac{9 \times 3}{18}$ $V$              **D. $\frac{18 \times 3}{9}$ $V$**

13. While shopping in a super market a student notices that a loaded trolley is difficult to start and difficult to stop. Which of the following accounts for these observations?

A. Friction                                      B. density

**C. inertia**                                      D. energy

14. In a hydraulic press, the area of the pistons on which the effort is applied is made smaller in order to………

**A. obtain pressure as large as possible.**

B. transmit pressure throughout the liquid

C. transmit a force large enough to the load

D. facilitate the movement of the piston downward

15. Which of the following properties of a solid would change if it were transported from earth to the moon?

A.  Mass                                          B. Volume

**C. Weight**                                      D. Density

**16.** Which of the following is observed when a bob falls through oil contained in a tall jar?

    A. The bob accelerates uniformly and then stops moving

    **B. <u>The bob accelerates uniformly and then moves with a constant velocity</u>**

    C. The bob does not move at all

    D. The bob moves with constant velocity all through

**17.** A hot metal suspended on a thread in a vacuum loses heat mainly by;

    A. convection

    **B. <u>radiation</u>**

    C. conduction

    D. conduction and convection

**18.** Two objects P and Q are in a straight line. P is 3m behind Q and Q is 6 m in front of a plane mirror. How for is Q from the image of P?

    A. **<u>12 m</u>**                    C. 15 m

    B. 9 m                       D. 18 m

**19.** Which of the following are likely to cause emission of electrons?

    **A. <u>Infrared rays and gamma rays</u>**

    B. Ultraviolet light and ultra sound

    C. Microwaves and radio waves

    D. Visible light and ultra violet light

**20.** Glass is heat treated in order to;

    A. Make it resistant to tension

    B. Make it resistant to compression

    **C. <u>Reduce the effect of a notch</u>**

    D. Make it attractive

## SECTION B

**21.** (a) Define the term **uniform velocity**.                      (01 mark)

      *A constant rate of change of displacement* ✓ ................................................................................

  (b) The figure below shows a ticker tape pulled through a timer by a trolley moving with uniform velocity.



*Direction of motion of trolley*

If the frequency of the timer is 50 Hz, calculate the speed of the trolley.        (02 marks)

$Speed = distance/time = \frac{d}{t}$

*But d = 3 m*

$t = \frac{number\ of\ spaces\ between\ dots}{frequency}$    OR    $t = \frac{n-1}{f}$ where n = number of dots

$t = \frac{5}{50} = 0.1\ s$                                    $t = \frac{6-1}{50}$   *hence* $\frac{5}{50} = 0.1\ s$

**Hence speed** $= \frac{3}{0.1} = 30\ ms^{-1}$

(c) Explain why the weight of a body reduces as it is taken higher from the earth's surface.
(02marks)

*The weight reduces because as you go higher, **acceleration due to gravity reduces**, yet **weight is directly proportional to acceleration due to gravity** at a place .* ...........................

**22.** (a) State two differences between good conductors of heat and insulators.        (01 mark)

| good conductors of heat | insulators |
|---|---|
| - *Allow heat to pass through them easily* <br> - *Have free electrons/electrons are free to move* | - *Don't allow heat to pass through them easily* <br> - *Electrons tightly fixed to atoms / electrons are not free to move* |

(b) Explain why cool air blows from the sea towards land on a hot day.        (02 marks)

...........*The **temperature of the land increases faster than that of the sea water** due its **low specific heat capacity**. The **land heats the air above it and makes it to rise**. This is **replaced by cool air that blows from the sea**.*

(c) The mercury thread in a thermometer is 32 cm long at 80 ℃. Calculate the temperature which the thread is 12 cm long.        (01 mark)

$32\ cm \longrightarrow 80\ ℃.$

$1\ cm \longrightarrow \frac{80\ ℃}{32}$

$12\ cm \longrightarrow \frac{80\ ℃}{32} \times 12 = \mathbf{30℃}$

**23.** (a) What are cathode rays?        (01 mark)

*Streams of fast moving electrons produced from a hot cathode* ...........................

(b) Explain briefly how cathode rays are produced in a cathode ray tube.
(02 marks)

*a metal filament is heated by current from a low voltage source, making it to produce electrons by thermionic emission. The emitted electrons are accelerated to a high speed towards the fluorescent screen by the high voltage between the filament and the anode.*

(c) The **x-sensitivity** of a cathode ray oscilloscope is set to 1.5 Vcm⁻¹. A dc source produces a horizontal trace of length 2.25 cm when connected to the CRO. Calculate the emf of the source.

(01 mark)

$1\ cm \longrightarrow 1.5\ V$

$2.25\ cm \longrightarrow 1.5 \times 2.25\ V = 3.375\ V$

**24.** (a) Define electric current. (01 mark)

*Rate of flow of charge* ................................................................................................................

(b) A small battery was charged to 0.2 C and discharged steadily through a 2Ω resistor in 5 seconds. Calculate the voltage across the resistor during this time. (02 marks)

$Q = I \times t$

Hence $I = \dfrac{Q}{t} = \dfrac{0.2}{5} = 0.04\ A$

But $V = I \times R$

$V = 0.04 \times 2 = 0.08\ V$

(c) Why is it difficult to carry out electrostatic experiments from a moist environment?

(01 mark)

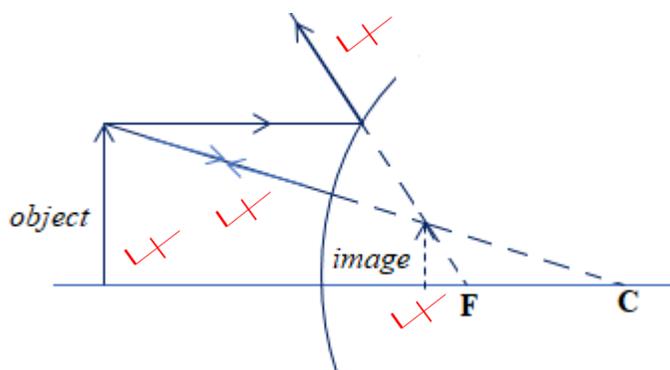*Air in a moist environment contains water which is a good conductor of electricity. All charges produced are lost immediately* ................................................................................................................

**25.** (a) Define the radius of curvature of a convex mirror. (01 mark)

*Radius of the sphere from which the mirror was got.*

(b) Sketch a ray diagram to show the formation of an image of an optical pin placed in front of convex mirror. (02 marks)



(c) From the above ray diagram, why is a convex mirror preferred in driving?

*It produces an erect image* ................................................................................................................

**END**