**PHYSICS**

**(THEORY)**

**MARKING SCHEME**

**TERM 1 2023 FORM 3 OPENER EXAM**

**Answer all the questions in the space provided**

1. Define pressure and state its SI unit (2marks)

***Is the force acting normally per unit area***

***SI unit is the newton per square metre***

1. **Figure 1** below shows a ray of light reflected from a mirror.

300

Figure 1

Complete the ray diagram and find the new angle of reflection after it is rotated 100 anticlockwise with the incident ray fixed. (2marks) **The angle of incidence = 500**

1. Three electric bulbs are connected in series with a battery of two dry cells and a switch. At first the bulbs light brightly.
2. State a reason why they gradually light dim. (2marks)

**Polarization increases internal resistance of the cell reducing the flow of current**

1. A positively charged rod is brought near the cap of a lightly charged electroscope. The leaf first collapses and as the rod comes nearer, the leaf diverges.
2. What is the charge on the electroscope? (1mark) **Negative**
3. Explain the behavior of the leaf. (2marks)

***More electrons are attracted to the cap leaving the rod and leaf neutral as it is moved closer more electrons are pulled up leaving the rod and leaf more positive so the leave divergence increase***

1. Figure 2 below shows a bar magnet attracting steel pin as shown

N

S

X

Y

Steel pin

Figure 2

 State and explain what would happen when a North pole of a bar magnet is brought near the tips of steel pin X and Y. (2marks)

 ***Steel pins X and Y are attracted to the pole of the magnet. Unlike pole attract***

1. Figure 4 below shows a wave profile for a wave whose frequency is 5Hz.

t3

t5

t7

t9

t1

Time (s)

Displacement (cm)

1

-1

-2

Figure 4

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Determine the value of t8. (2marks)

**t8 = 0.2 x2 = 0.4 second**

1. An electromagnetic radiation whose wavelength is greater than that of microwaves has a wavelength of 306.1224 m. Take speed of light in air, c = 3 x108 m/s.
2. Calculate its frequency. (2marks)

**Frequency =** $\frac{3 x 10^{8}}{306.1224}$ **= 9.8 x 105Hz**

1. Figure 5 below show a conductor carrying electric current place between two magnetic poles.

N

S

Figure 5

Complete the diagram by sketching the magnetic field and also show the direction of the force on the conductor. (3 marks)

***Sketch magnetic field patterns around the conductor; the field patterns due to permanent magnet ; and the resultant force which is acting downwards;***

1. (a) A disc of a siren with 100 holes is rotated at constant speed making 0.5 revolutions per second. If air is blown towards the holes, calculate:
2. The frequency of the sound produced. (1marks)

 **=0.5×100**

 **F=50Hz**

1. The wavelength of the sound produced, if the velocity of sound is 340 m/s. (2marks)

**v=fµ**

**340=50µ**

**µ=6.8m**

1. (a) Distinguish between principal focus and focal length of a concave lens. (1mark)
2. (a) (i) F igure 10 shows a graph of 1/v against 1/u for a concave mirror. Use your graph to determine the focal length of the mirror. (2marks)

Figure 10

0.08

0.04

0

0.12

0

1/u cm-1

1/v cm-1

0.12

0.08

0.04

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**Focal length = 1/0.1 = 10 cm (the reciprocal of the intercepts)**

 (b) State **one** application of each of the following

 (i) Convex mirror. (1mark) **As driving mirrors**

 (ii) Parabolic mirror.(1mark) **In searchlights**

 (c) A small object is placed 15 cm in front of a convex mirror of focal length 10 cm. Determine the position of the image. (3marks)

$\frac{1}{f}$ **=** $\frac{1}{u}$ **+** $\frac{1}{v}$$\frac{1}{-10}$ **=** $\frac{1}{15}$ **+** $\frac{1}{v}$ **v= -6 cm**

11.A drum which is **2m** high contains water to a depth of **0.5 m** and oil of density **0.5 g/cm3** extends to the top. Find the pressure exerted at the bottom of drum by the two liquids.

 (3 marks)

**P=2×1000×10)+(0.5×500×10)**

**P=22,500N/m2**

12. A particle starts from rest and accelerates uniformly in a straight line. After

**3** seconds it is **9m** from the starting point. Determine the acceleration of

the particle. (3marks)

 s=ut+1/2at2

13. A mass is projected horizontally from height of **5m** above the ground with a

velocity of **30m/s**. Calculate:

**a)** The time taken to reach the ground (3marks)

**h=1/2gt2**

**5=5t2**

**T=1s**

**b)** The horizontal distance traveled before hitting the ground (2marks)

**R=ut**

**R=30×1**

 **=30m**

**c)** The vertical velocity with which the mass hits the ground (2marks)

**V=u+gt**

**V=0+10×1**

 **=10m/s**

14. a) state Newton’s second law of motion (2marks)

**States that the rate of change of momentum is directly proportional to the resultant external force and takes place in the direction of force**

 b) A body of mass 2kg which is initially at rest on a horizontal ground moves with a constant velocity when a force of 5N is applied on it in a horizontal direction.

 i) State the reason why the body moves with a constant velocity (1mark)

**Force applied is equal to the friction force**

 ii) What is the value of friction force (1mark)

**Friction=5N**

 iii) Calculate the acceleration on the same body when the force is increased to 9N (3marks)

**F=9-5**

 **=4N**

**F=ma**

**4=2a**

**a=2m/s2**

 c) Explain why a high jumper lands on a mattress. (2marks)

**To reduce the impulsive force by allowing more time of impact**