MATIGO EXAMINATIONS BOARD

535/1
PRE MOCK PHYSICS
MARKING GUIDE 2023
PAPER 1
SECTION A: (40 MARKS)

1. When a beam of alpha particles was fired at a thin gold film, some of the particles were considerably deflected. This experiment shows that;
   A. Alpha particles are very light
   B. Electrons in the gold nucleus attract alpha particles
   C. A gold nucleus is concentrated in a small volume
   D. Electrons in the gold nucleus attract alpha particle

   C ✓

2. A small electric lamp when placed at the focal point of a converging lens will produce.
   A. Parallel beam of light
   B. Converging beam of light
   C. Diffuse beam of light
   D. Diverging beam of light

   A ✓

3. The property which distinguishes longitudinal waves from transverse waves is;
   A. The wave length
   B. The Velocity
   C. The ability to be refracted
   D. The relative directions of oscillation and propagation

   D ✓

4. When you step from a roaring boat, the boat moves in the opposite direction with;
   A. Greater force   C. An equal force
   B. Less force   D. No force

   C ✓

5. A thermopile is an instrument which converts;
   A. Heat energy to electrical energy
   B. Electrical energy to light energy
   C. Light energy to electrical energy
   D. Chemical energy to heat energy

   A ✓

6. A machine of velocity ratio 5 is used to raise a load whose weight is 200N. If the efficiency of the machine is 80%, the effort required is;

    A. 50N   C.   80N

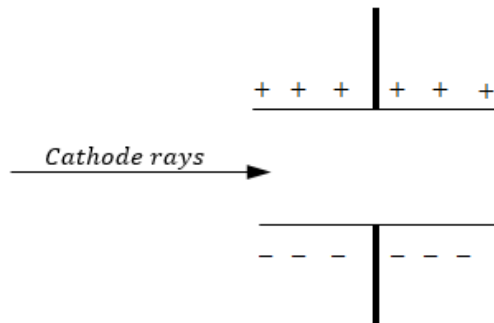   B. 25N   D.   60N

A
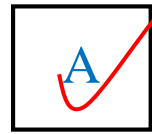
7. The distance between the lower fixed point and upper fixed points on the Celsius scale in unmarked mercury in glass thermometer is 25cm. If the mercury level is 5cm below the upper fixed point, then the temperature is;

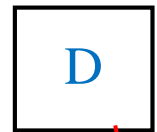   A. 5°C   C. 20°C   B.80°C   D. 95°C

B
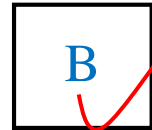
8. A beam of cathode rays is passed through an electric field between two parallel plates.
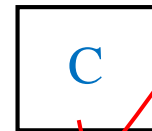

In which direction is the beam deflected;

    A. Into the page

    B. Out of the page

    C. Towards the bottom plate
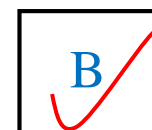
    D. Towards the top plate

D

9. An enclosed mass of a gas occupies $4 \times 10^{-3} m^3$ at a pressure of 100kPa. Calculate the volume of the gas when the pressure changes to 80kPa at a constant temperature

    A. 2.2×10^{-3} C. 5.0×10^{-3}

    B. 3.2×10^{-3} D. 4.0×10^{-3}

C

10. A certain FM radio station operates at a frequency of 1.08×10^6 Hz. Calculate the wave length of the radio waves.

    A. $3.60 \times 10^3\ m$ C. $2.78 \times 10^{-2} m$

    B. $2.78 \times 10^2\ m$ D. $3.60 \times 10^{-2} m$

B

11. A S.4 student would like to measure the thickness of a barbed wire on a school fence. The best instrument the student should use is;

A. A vernier caliper
B. Micrometer screw gauge

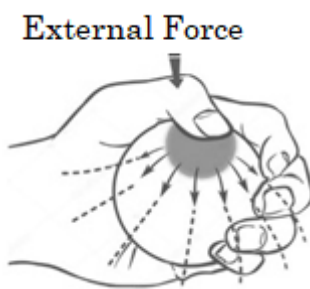C. Tape measure
D. Metre rule

B

12.

External Force

Figure 1

The diagram in the figure above shows the behavior of water in a balloon with identical holes. The conclusion that can be drawn from the observation is;

A. Pressure in fluids increases with depth
B. Pressure is maximum at mid height
C. Pressure reduces with depth
D. Pressure at any point acts equally in all directions

D

13. Water waves change direction when they move from shallow to deep water. What term describes this process?

A. Dispersion
B. Diffraction

C. Refraction
D. Reflection

C

14. Which colour are observed in regions A and B?
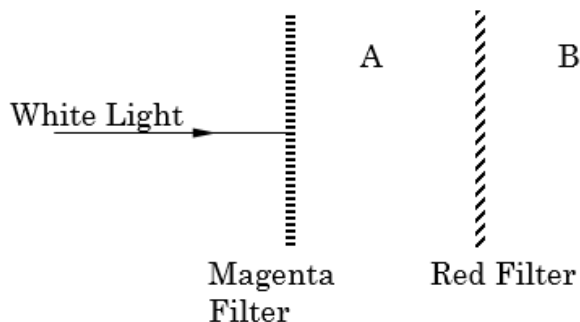
A   B

White Light

Magenta   Red Filter
Filter

Figure 2

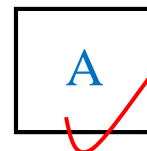|	Region A	Region B
A.	Red and Blue	Red
B.	White	Red
C.	Magenta	White
D.	Green and red	Yellow

A
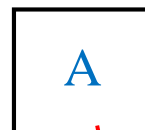
**15.** The note from a plucked guitar will have a low pitch if the string is;

A. Thick and long C. Thick and slack

B. Thin and short D. Thin and long

A

**16.** Which of the following statements is true about the wave travelling from one medium to another?

i) Its frequency and wavelength change ii) Its velocity and wave length change iii) Its frequency and velocity change iv) Only its frequency remains unchanged

A. (i) only C. (ii) and (iii) only

B. (i) and (iii) only D. (ii) and (iv) only

D
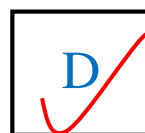
17. The temperature at which all the heat energy is removed from a substance is called;

A. Kelvin temperature C. Celsius temperature

B. Absolute zero temperature D. Freezing temperature

B
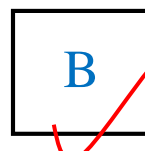
18. Calculate the effective resistance for the arrangement in Fig.3
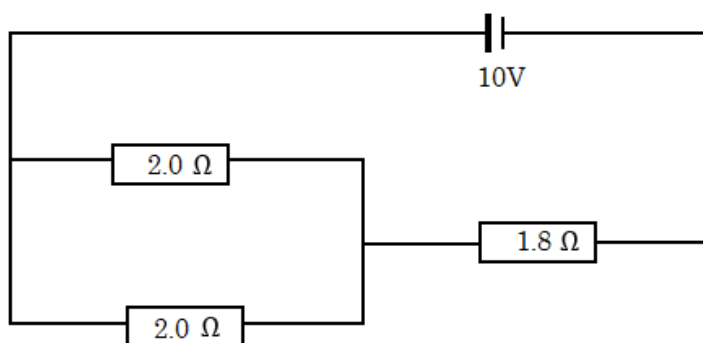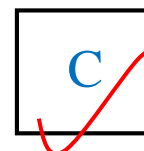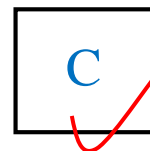
10V

2.0 Ω

1.8 Ω

2.0 Ω

Figure 3

C

A. 0.7Ω C. 3.8Ω

B. 3.0Ω D. 6.8Ω

19. A body of mass 10kg moves with a uniform velocity of $5\ ms^{-1}$. Find its momentum in kgms-1.
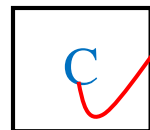
A. 2

C. 50

B. 4

D. 100

C ✓

20. An image formed by a concave mirror coincides with its object placed 20cm away. Find the focal length of the mirror.

A. 5cm

C. 10cm

B. 20cm

D. 40cm

C ✓

21. The figure below shows a sketch graph of acceleration against time for a body initially at rest.
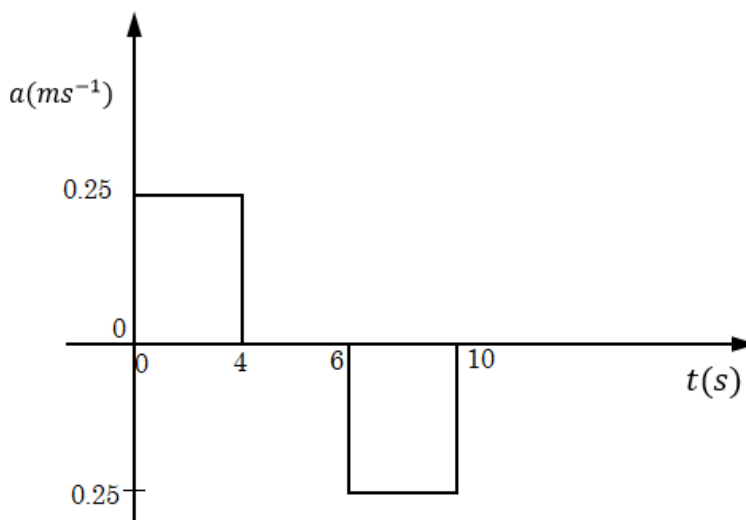

Figure 4

The velocity of the body in the first 4s is?

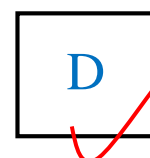A. 0.25ms-1

C. 25ms-1

B. 1.0ms-1

D. 2.5ms-1

B ✓
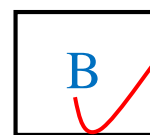
22. On a frosty day, the metal handle bars of a bicycle feel colder than the rubber grips because the;

A. Rubber is a better absorber of radiation than the metal

B. Metal is colder than the rubber

C. Rubber has higher heat capacity than the metal
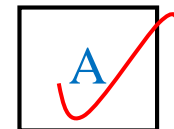
D. Metal is a better conductor of heat than the rubber.

D ✓

5

23. A water pump raises 200kg of water through a vertical height of 72m in one hour. Calculate the power of the pump.

A. 400,000W
C. 4,000W

B. 400W
D. 40W

D
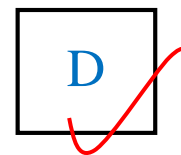
24. Sea breeze occurs

A. When cool air blows towards the land

B. When warm air blows towards the land

C. During the night

D. When cool air blows towards the sea

A

25. Which of the following graph represents the variation of activity of a radioactive substance with time?

Figure 5

D
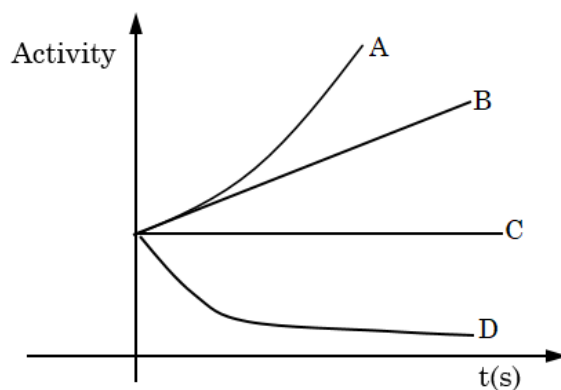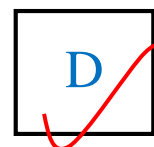
26. A negatively charged rod is brought close to an uncharged metal sphere which is held on an insulated stand. Which of the following diagrams shows the distribution of charge on the sphere when the rod is near?

B
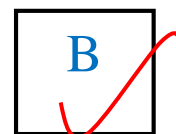
27. The characteristics of an image formed in a a plane mirror is?

A. Upright, real with magnification of 2

B. Upright, virtual with magnification of 1

C. Inverted, real with magnification of 2

D. Inverted, virtual with magnification of 1

B

28. In a simple cell, the convectional flow of current is;
    A. From the positive to the negative terminal of the cell
    B. From the negative to the positive terminal
    C. Due to polarization
    D. Due to local action

A ✓

29. A load of 40N is pulled steadily from A to B along an inclined plane by a force F is shown in figure 6. Find the velocity ratio of the system.

Figure 6

A. 0.866   C.   0.500
B. 2.000   D.   4.000

B ✓

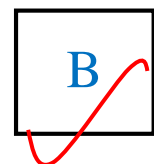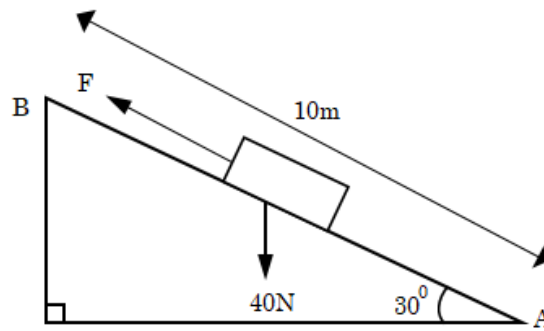30. Which **one** of the following diagrams shows the arrangement of forces which gives the greatest acceleration of the block?

10N ⟶ [A] ⟶ 12N   20N ⟵ [C] ⟶ 40N

2N ⟶ [B] ⟵ 4N   20N ⟵ [D] ⟵ 30N
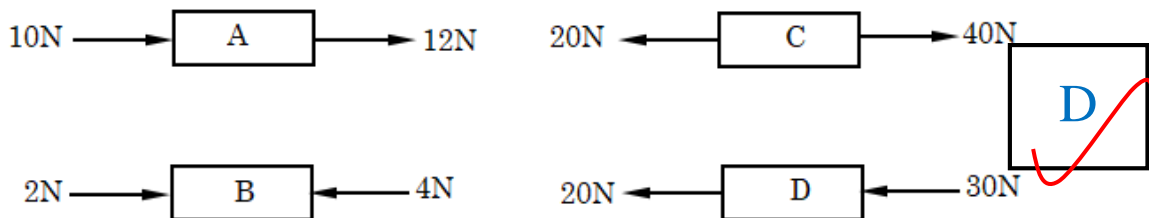
D ✓

31. A body of mass 1500g is placed on a planet where the acceleration due to gravity is two – fifth that of the earth. Find the weight of the body on the planet.

A. $\dfrac{1500 \; x \; 10}{5}$

B. $\dfrac{1500 \; x \; 2 \; x \; 10}{1000 \; x \; 5}$

C. $\dfrac{1500 \; x \; 5 \; x \; 10}{100 \; x \; 2}$

D. $\dfrac{1500 \; x \; 2 \; x \; 10}{5}$

B ✓

32. White light is separated into its component colours by a prism due to;

A. Absorption   C. Dispersion

B. Reflection   D. Transmission

C ✓

33. A load of 4N stretched a spring by 0.5cm. Calculate the extension when a load of 8N is applied.

A. 0.25cm   C. 1.0cm

B. 2.0cm   D. 4.0cm

C ✓

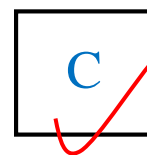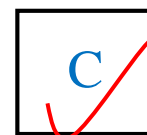**34.** A vibrator produces waves which travel a distance of 35cm in 2 s. If the distance between successive wave crests is 5cm, what is the frequency of vibrator?

A. 3.5Hz   B. 14.0Hz   C. 7.0Hz   D. 87.5Hz.

A ✓
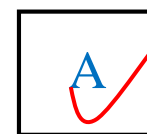
35. When a ray of light incident on a plane mirror at an angle of incidence of 31^0 is reflected from the mirror, it subsequently strikes a second plane mirror placed so that the angle between the mirrors is 45^0. The angle of reflection at the second mirror is;

A. 62^0 C. 14^0

B. 90^0 D. 76^0

C ✓
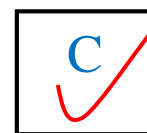
36. The pressure of the air inside a car tyre increases if the car stands for some time in full light. According to the kinetic theory, this is due to an increase inside the tyre of the;

A. Speed of the air molecules

B. Number of air molecules

C. Size of the molecules

D. Total mass of the air molecules

A ✓

37. When the circuit in fig. 7 is switched on, the voltmeter

Figure 7

A. Shows no deflection

B. Deflects in a wrong direction

C. Reads the Emf of the cell

D. Reads of the internal resistance of the cell

C

38. A simple thermometer has a stem and a bulb containing a liquid. Which one of the following will help the thermometer to rapidly register a new temperature?
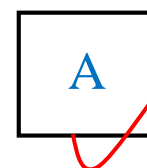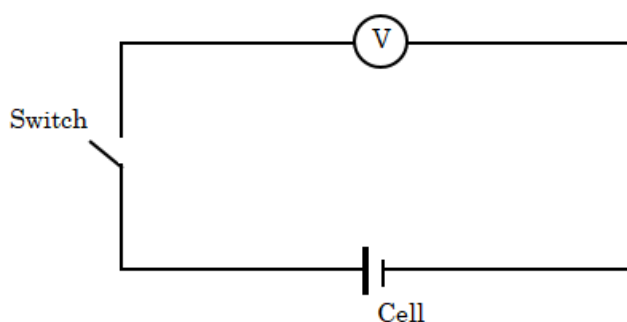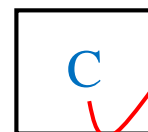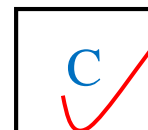
A. A larger bulb

B. A long stem

C. A thin walled bulb

D. A liquid of high density

C

39. Which of the following are applications of total internal reflection of light?

i) Optical fibres   ii) Transmission of radio waves   iii) Total reflecting prisms iv) Mirage

A. (i) only

B. (i), (ii) and (iv) only

C. (i) and (iii) only

D. (i), (ii) and (iii) only

D
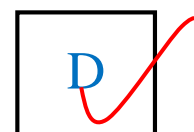
40. The unit $1VA^{-1} = 1\Omega$ is the SI-Unit of;

A. Electric current

B. Resistance

C. Emf

D. Potential difference

B
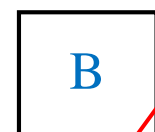
SECTION B: (40 MARKS)

41. (a) Define the following terms as used in light;

(i) **Critical angle**   (01 mark)

Is the angle of incidence in a dense medium for which the angle of refraction in a less dense medium is 90^0

(ii) **Total internal reflection**.   (01 mark)

Is the bouncing back of light rays into a dense medium when the angle of incidence in a dense medium exceeds the critical angle.

(b) Total internal reflection is applicable in the transmission of radio waves. Briefly explain how radio waves are transmitted from the transmitter to the receiver.   (02 marks)

Air layers near the ground are <u>cool and are more dense</u> than air layers above

Radio signals from a transmitter station are <u>sent into the sky</u>

The waves are <u>continuously refracted away</u> from the normal

The waves undergo <u>total internal refraction</u> and are received by the receiver at the end

41. (a) State **two** factors on which pressure exerted by a liquid depends.

(02 marks)

Depth of the liquid

Density of the liquid

(b) A block of mass 2kg measures 0.20m by 0.15m by 0. 1m. Calculate the least pressure exerted by the block on the ground. (02 marks)

$$Least\ force\ = \frac{F}{largest\ area} = \frac{2 \times 10}{0.15 \times 0.2} = 666.667Pa$$

43. (a) Define the term **terminal velocity**. (01 mark)

Maximum constant velocity attained by a body falling through a viscous fluid

(b) Explain why a parachutist usually travels at a constant velocity for the last part of his drop. (03 marks)

Sum of up thrust and viscous force balances

with the weight of the parachutist

The net force on the parachutist is zero

Hence a constant velocity

44. (a) The following nuclear reaction takes place when a neutron bombards a Sulphur atom

$$^{34}_{16}S + ^{1}_{0}n \rightarrow ^{a}_{b}Y$$
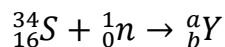
(i) State the values of **a** and **b** (01mark)

$a = 35$

$b = 16$

(ii) The nuclide Y decays by emission of alpha particle forming an atom Q. Write a balanced equation to show the changes in the mass number and atomic number of the nuclide. (01 mark)

$^{35}_{16}Y \rightarrow ^{31}_{17}X + \ ^{4}_{2}He$

(b) **93.75** % of a radioactive Cobalt-60 decays in 4488 years. Determine the half life of Cobalt -60. (02 marks)

$$\%left = 100 - 93.75 = 6.25\%$$

$$100\% \xrightarrow{t_{\frac{1}{2}}} 50\% \xrightarrow{t_{\frac{1}{2}}} 25\% \xrightarrow{t_{\frac{1}{2}}} 12.5\% \xrightarrow{t_{\frac{1}{2}}} 6.25\%$$

$$4t_{\frac{1}{2}} = 4488$$

$$t_{\frac{1}{2}} = 1122$$

45. (a) State the **law** of electrostatics. (01 mark)

   Like charges repel, unlike charges attract

   (b) A charge of 180C flows through a circuit for 2 minutes. Find the electric current flowing through the circuit. (03 marks)

   $$I = \frac{Q}{t} = \frac{180}{2 \times 60} = 1.5A$$

46. (a) What is meant by the term **antinode** as applied in waves? (01 mark)

   A point a long a stationary wave at which particles of the medium vibrate with maximum amplitude.

   (b) State **two** factors that affect diffraction of sound waves (01 mark)
   Wave length of the sounds wave
   Size of the gap in a barrier

   (c) A sound wave of frequency 440Hz has a velocity of 330ms^{-1}. Calculate its wave length. (02 marks)

   $$\lambda = \frac{V}{f} = \frac{330}{440} = 0.75m$$

47. (a) (i) State the principle moments. (01 mark)

   when a body is in equilibrium, the sum of clockwise moments about apoint is

   equal to the sum of anticlockwise moments about the same point.

   (ii) State any **two** applications of the principle of moments.

   (01 mark)

   seesaw
   beam balance
   Determination of relative density of substance

(b) A uniform metre rule is pivoted at the 40cm mark as shown in fig.8. The metre rule balances when a weight of 20N is placed at the 10cm mark.
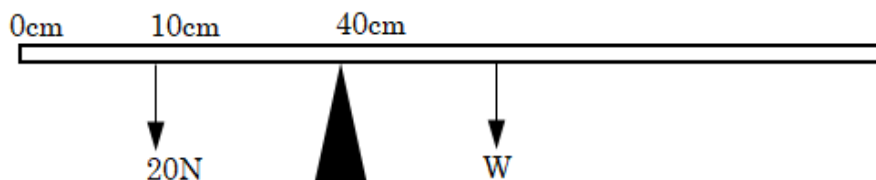

Figure 8

Calculate the weight of the metre rule W.   (02 marks)
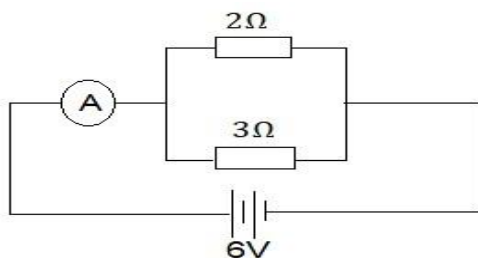
$w \times 10 = 30 \times 20$

$w = 60N$

48. (a) State the **two** defects of a simple cell and suggest a remedy to each.
                                                             (02 marks)

local action ; −malgamation

Polarisation ; −depolarisation agent,

; −Brushing the hydrogen bubles

(b) Two resistors of 2Ω and 3Ω are connected with a cell of Emf 6V and negligible internal resistance as shown below

Determine the current flowing through the ammeter A.   (02 marks)

$$R = \frac{R_1 R_2}{R_1 + R_2} = \frac{2 \times 3}{2 + 3} = 1.2\Omega$$

$$I = \frac{V}{R} = \frac{6}{1.2} = 5A$$

49. (a) Distinguish between **Renewable energy sources** and **non-renewable energy sources.**   02 marks)

Renewable energy sources – energy sources which can be replaced once used up
                            while
non − renewable sources are those which cannot be replaced when used up.

12

(b) A man lifts a bag of mass 60kg through 1.5m in 15s. Calculate the power expended. (02 marks)

$$power = \frac{mgh}{t} = \frac{60 \times 10 \times 1.5}{15} = 60W$$

50. (a) Define **heat capacity**. (01 mark)

Quantity of heat required to raise the temperature of a given mass of a substance by $1K$.

(b) Calculate the quantity of heat required to raise the temperature of 5kg of iron by 65°C given that the specific heat capacity iron is 460Jkg⁻¹K⁻¹. (02 marks)

$$Q = mc\Delta\theta$$

$$Q = 5 \times 460 \times 65$$

$$= 149500J$$

The specific heat capacity of water is 1000Jkg⁻¹K⁻¹. State the importance of this high value of specific heat capacity. (01 mark)

Used as a coolant in car engine

END

(+256780413120)

13