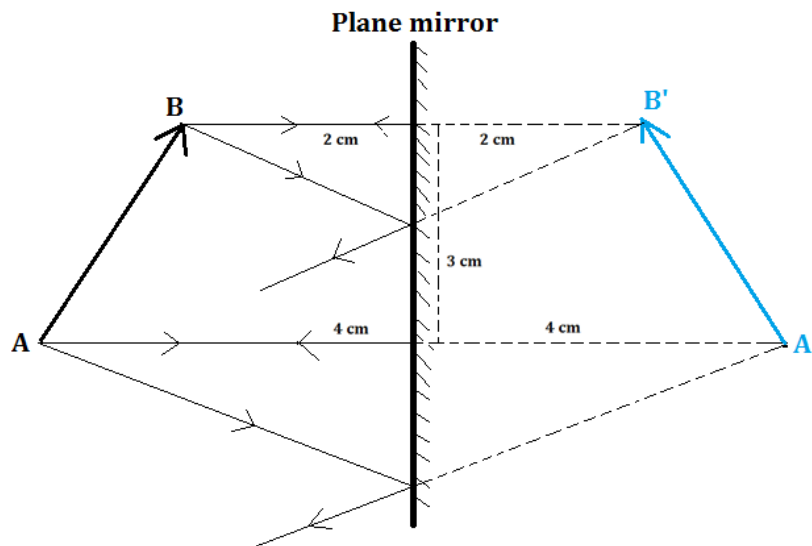


**MARKING SCHEME OF ORDINARY LEVEL PHYSICS
NATIONAL EXAMINATION 2020-2021**

SECTION A: Answer all questions

1. a) False
b) True
c) False
d) True
e) True
2. a) Difference in temperature of the object and the environment
b) Thermoregulation
c) Plant growth
d) Global warming, greenhouse effect, carbon dioxide.
3. a)

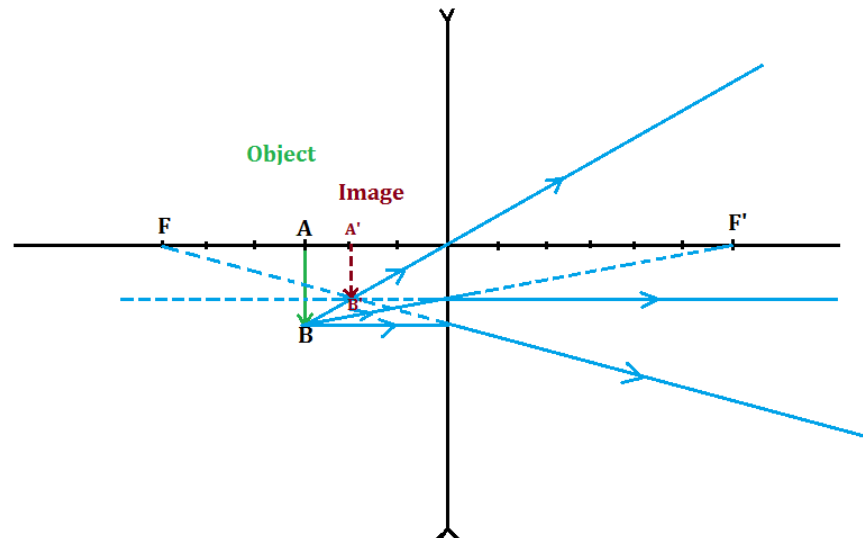


- b) Characteristics of the obtained image:
 - It has the same size as the object
 - The image is virtual
 - The image is upright / erect
 - Located at the same distance as the object.
4. a) Yes. The incident ray, the reflected ray and the normal all lie in the same plane.
The angle of incidence is equal to angle of reflection.
- b) i) Concave
ii) Bigger than the object
5. a) J/kg
b) It loses heat to the external environment. Heat flows from a region of high temperature (hot object) to a region of low temperature (external environment).

- c) It means that the amount of heat energy necessary to raise the temperature of water of 1 kg by one Celsius degree is 4200 J.
6. a) Current, resistance, time
 b) Magnetic effect
 c) Chemical effect, light effect
7. a) Evaporation
 b) i) Evaporation, simple distillation
 ii) Filtration, evaporation, simple distillation
8. a) Q : heat energy supplied
 W : Work done
- b) $\Delta U = W + Q = -W - Q = -140 - 60 = -200 \text{ KJ}$
- c) Manufacture of home appliances like thermos flask.
 Working of refrigerators and air conditioners.
 Manufacture of car engines.
9. a) This process is carried out at constant pressure. So, it is **isobaric**.
 b) This process is carried out at constant volume; so it is **isochoric** (isovolumetric).
 c) Pressure law or Guy-Lussac law.
10. a) Density $= \frac{m}{V} = \frac{60.30 \text{ g}}{30.0 \text{ m}^3} = 2.01 \text{ g/cm}^3$
- b) Absolute uncertainty
- $$\frac{\Delta m}{m} + \frac{\Delta V}{V} = \frac{0.2}{60.30} + \frac{0.1}{30.00} = \frac{\Delta P}{2.01}$$
- $$\Delta P = \left(\frac{0.2}{60.30} + \frac{0.1}{30.00} \right) \times 2.01 \approx 0.0134 \text{ g/cm}^3$$
- Hence $\rho = (2.01 \pm 0.013) \text{ g/cm}^3$
11. a) Atmospheric pressure decreases as altitude increases.
- b) $\rho = \frac{m}{V}$; $m = \rho \times V = 1.0 \times \frac{10^3 \text{ kg}}{\text{m}^3} \times 0.0456 \text{ m}^3 = 45.6 \text{ kg}$
- Mass of the rock = mass of displaced water
- Weight of displaced water = upthrust = $45.6 \text{ kg} \times 9.81 \frac{\text{N}}{\text{kg}} = 447.3 \text{ N}$
12. a) Impulse = $F \times t = 2 \text{ N} \times 3 \text{ s} = 6 \text{ Ns}$
- b) $F \times t = m(V - u)$, $u = 0$
- $$6 = 1.5 (V - 0)$$
- $$6 = 1.5 V$$
- $$V = \frac{6}{1.5} = 4 \text{ m/s}$$

- e) Resistors can be made of the same material but may have different cross sectional areas.

17. a)



b) (i) $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

u stands for the distance of the object from the optical centre.

v stands for the distance of the image from the optical centre.

f stands for the focal length of the lens.

$$\frac{1}{-6} = \frac{1}{3} + \frac{1}{v}$$

$$\frac{1}{-6} - \frac{1}{3} = \frac{1}{v}$$

$$\frac{3+6}{-18} = \frac{1}{v}$$

$$v = -\frac{18}{9} = -2 \text{ cm}$$

(ii) Magnification = $-\frac{v}{u} = \frac{2}{3} = \frac{2}{3}$

Size of image = size of object x magnification = $1 \text{ cm} \times \frac{2}{3} = \frac{2}{3} \text{ cm}$

- c) i) The image is **diminished**.
 The image is **virtual**.
 The image is on the **same side as the object**.

d) Correction of eye defects.

18. a) i) Coal, peat, petroleum products.
 ii) From the interior of the earth, where dead material decayed over a long period of time.

- b) i) Sun, wind, hydroelectric energy, biomass, geothermal energy
 ii) Biomass

- c) It does not pollute the environment.
It is cheap.
It is easily available.

19. a) Levers, pulleys, inclined plane, wheel, screw and axle.

- b) i) Stairs: inclined plane
A shovel / spade: lever

c) $VR = 4$

$$\eta = 80\%$$

i) $\frac{MA}{VR} = \eta$

$$\frac{80}{100} = \frac{MA}{4}$$

$$MA = \frac{80 \times 4}{100} = 3.2$$

ii) $L = 480 \text{ N}$

$$MA = \frac{L}{E}$$

$$3.2 = \frac{480}{E}$$

$$E = \frac{480}{3.2}$$

$$E = 150 \text{ N}$$

20. a) Measurement of blood pressure
Determination of relative densities of fluids.

b) i) $P = 101.3 \text{ KPa} = 101.2 \times 10^3 \text{ Pa} = 101.2 \times 10^3 \text{ N/m}^2$

ii) $11.2 \text{ cm} = 11.2 \times 10^{-2} \text{ m} = 112 \times 10^{-3} \text{ m} = 0.112 \text{ m}$

- c) i) The air in the sealed container has more pressure since absolute pressure is equal to gauge pressure plus atmospheric pressure.

ii) $P_{oil} = \rho \times g \times h = 860 \times 9.81 \times 11.2 \times 10^{-2} = 944.89 \text{ Pa}$

iii) No one

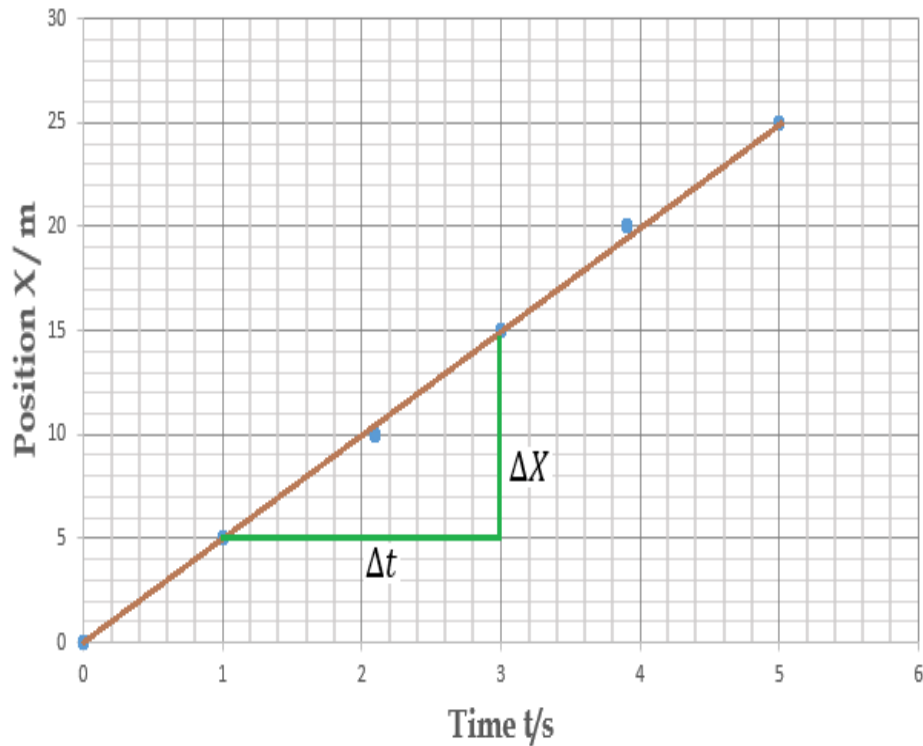
iv) $P_{air} = P_{oil} + P_{atm} = 944.89 + 101200 = 102144.89 \text{ Pa}$

SECTION C: This question is compulsory

21. a) The engineers wanted to know the performance of their engine.

- b) (i) Independent variable: time
(ii) Dependent variable: distance

c)



d) (i) Slope = $\frac{\Delta X}{\Delta t} = \frac{15-5}{3-1} = \frac{10}{2} = 5$

(ii) Slope corresponds velocity or speed of the car.

e) Some readings do not match with the best fit line.