الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

ACADEMIC YEAR 2023 - 2024

Program	Year	Semester	Paper
PE	1	1	MAIN

MODULE NAME:	**APPLIED PHYSICS**		
MODULE CODE:	**TPHYS**	**EXAM DATE:**	**25-12-2023**
INSTRUCTOR's NAME:	**Ranjit V**	**DURATION:**	**2 hrs**

Questions to be answered on:	**Allowed tools:**	**Number of pages**
✓ Space provided on the question paper	Pen, Pencil & Calculator	(Incl. cover page): **10**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English.**
- Write all the answers in **blue or black pen only.**
- Use the **pencil** only for **diagrams & graphs.**
- Show all the calculation steps in the given space.
- When finished submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

STUDENT NAME:

STUDENT ID:

FINAL MARKS

	40
	10

Number of answer scripts:……..…….

Invigilator:……..……..

Student's signature: ……

Time of receipt:……..…

INSTRUCTIONS

- *Express the **CORRECT** SI units for all the dimensional quantities or ½ **MARK** will be **deducted** from each **answer***

ANSWER ALL THE QUESTIONS IN THE SPACE PROVIDED

1. a) i) Define work done in physics. Write the mathematical formulae to find work done. **(1 mark)**

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ii) Whether work done can be +ve , - ve or zero. Explain your answer with suitable examples.

(2 marks)

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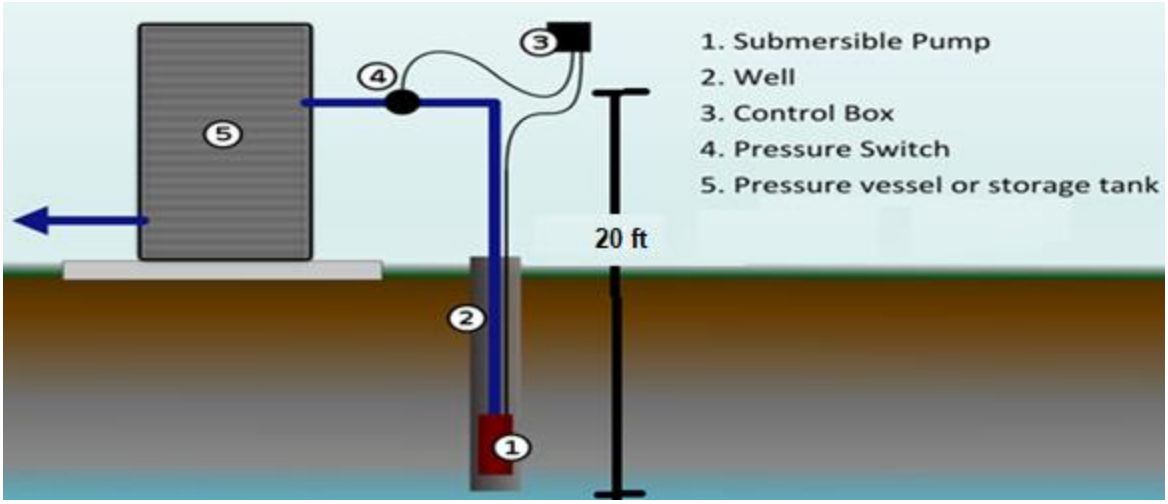
b) A submersible pump is used to lift the oil from the well as shown in the figure below.



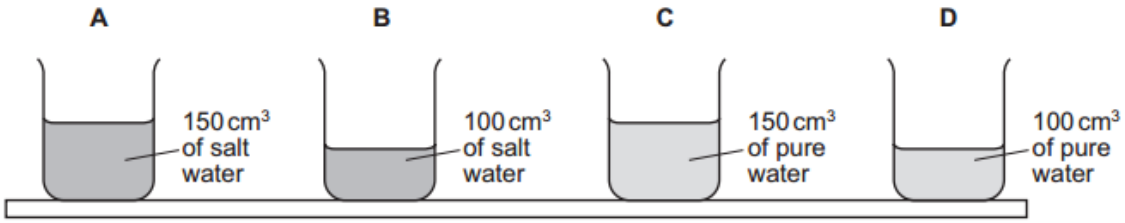
The pump operates at 440 V, 50A and lifts the oil of density 912 kg/m^3 at a rate of 0.5 ft^3/min to a height of 20 ft. The pump is operated for 5 min to fill the tank.

i) Determine the increase in potential energy of the oil stored in the tank. **(5 marks)**

(Use 1ft = 0.3048 m ; 1 min = 60 s)

ii) Determine the efficiency of the pump. **(3 marks)**

2. a) A student places four identical beakers on a bench. Two beakers contain salt water of density 1.1g/ cm^3 and two beakers contain pure water of density 1.0g/ cm^3.



Which beaker exerts the greatest pressure on the bench? Justify your answer with a suitable reason. **(2 marks)**

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b) An inspection hatch is located at the bottom of a open cylindrical tank of height 10 m. The tank is filled with naphtha of a relative density of 0.810.

Calculate the absolute pressure exerted by the naphtha at the inspection hatch. **(3 marks)**

[Use g = 9.81 m/s^2 ; $\rho_{water} = 1000\ kg\ m^{-3}$; P_{atm} = 101.325 kPa]

c) Calculate the force acting on the inspection hatch, if the diameter of the hatch is 600 mm.

[use 1m = 1000 mm] **(3 marks)**

3. a) State what is meant by the specific heat capacity of a substance. Write its SI units. **(2 marks)**

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b) Salim carries out an experiment to find the specific heat capacity of Copper.

He uses an electric heater and a thermometer, inserted into separate small holes in a copper block.

The following data are obtained.

Mass of copper block, m = 2.0 kg

Power of heating element, P = 420 W

Time of heating, t = 1 min 35 s

The initial temperature of the Cu block, T_1 = 19.5 °C

Final temperature of the Cu block, T_2 = 68.8 °C

Calculate the specific heat capacity of the copper block. **(4 marks)**

c) The actual value of the specific heat capacity of copper is 385 J/kg^0 C. Compare the experimental value of specific heat capacity with the actual value. **(1 mark)**

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d) Can you point out the experimental error that has led to a different experimental value of specific heat capacity than the actual value? **(1 mark)**

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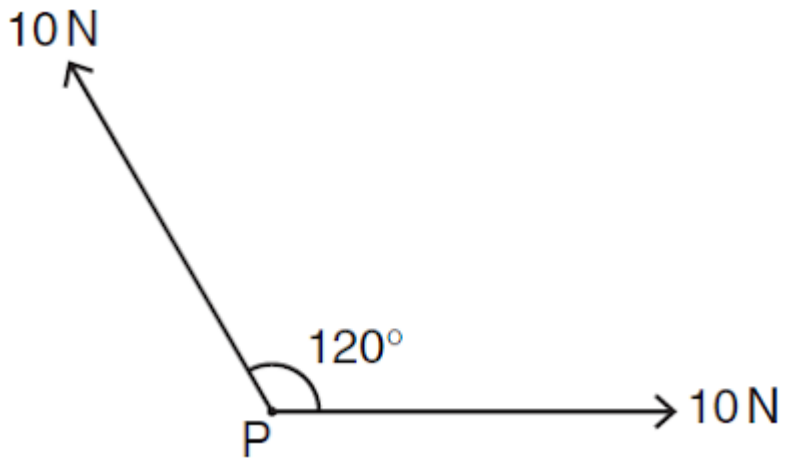
……

e) Suggest any two actions that Salim could take to reduce the loss of thermal energy from the surfaces of the block. **(2 marks)**

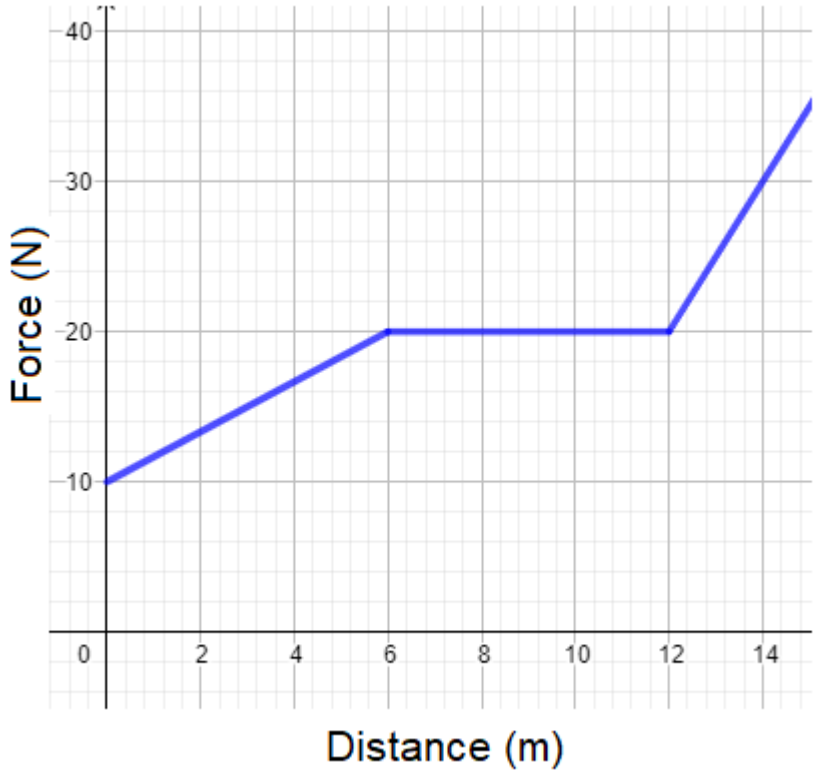
1. ……
2. ……

4. a) Two forces 10 N each act at the point P making an angle of 120^0 as shown in the figure below.

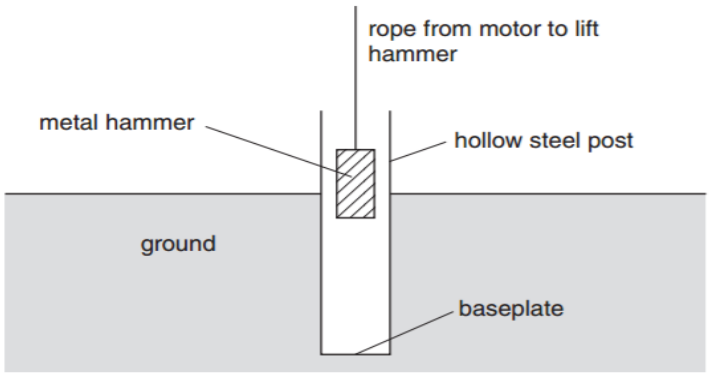


Calculate the resultant of the two forces acting at point P. **(2 marks)**

b) Determine the work done on moving an object from 0 m to 14 m using the following force vs. distance graph as shown bel **(5 marks)**



5. A metal hammer connected to a motor is used for drilling purposes in the industrial area. The metal hammer is lifted by the electric motor and then freely falls to hit the baseplate as shown in the figure below:



(savemyexam.com, n.d)

a) Name the type of energy the hammer possesses when it is lifted through some height from the ground. **(1 mark)**

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b) List two energy changes when the hammer falls and hits the baseplate. **(1 mark)**

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c) The metal hammer has a mass of 1500 kg and is lifted to a height of 10 m.

Calculate the kinetic energy of the hammer as it hits the baseplate. **(2 marks)**

Use the following conversion factor table:

1 hour = 3600 seconds	**1 m = 3.28 *ft***	**1 *lt* = 1000 cm^3**
1 hour = 60min	**1 kg = 1000 g**	**1 m^3 = 1000 *lt***
1 min = 60 sec	**1 day = 24 hours**	**1 ft = 12 in**
1 *ft* = 0.3048 m	**1 ton =1000 kg**	**1 kg = 2.205 *lb***
0 ^{0}C = 273 K		
note		
lb – pound ***lt – litre***	***in – inch***	***ft - feet***